IRON & COAL

ESTABLISHED 1864

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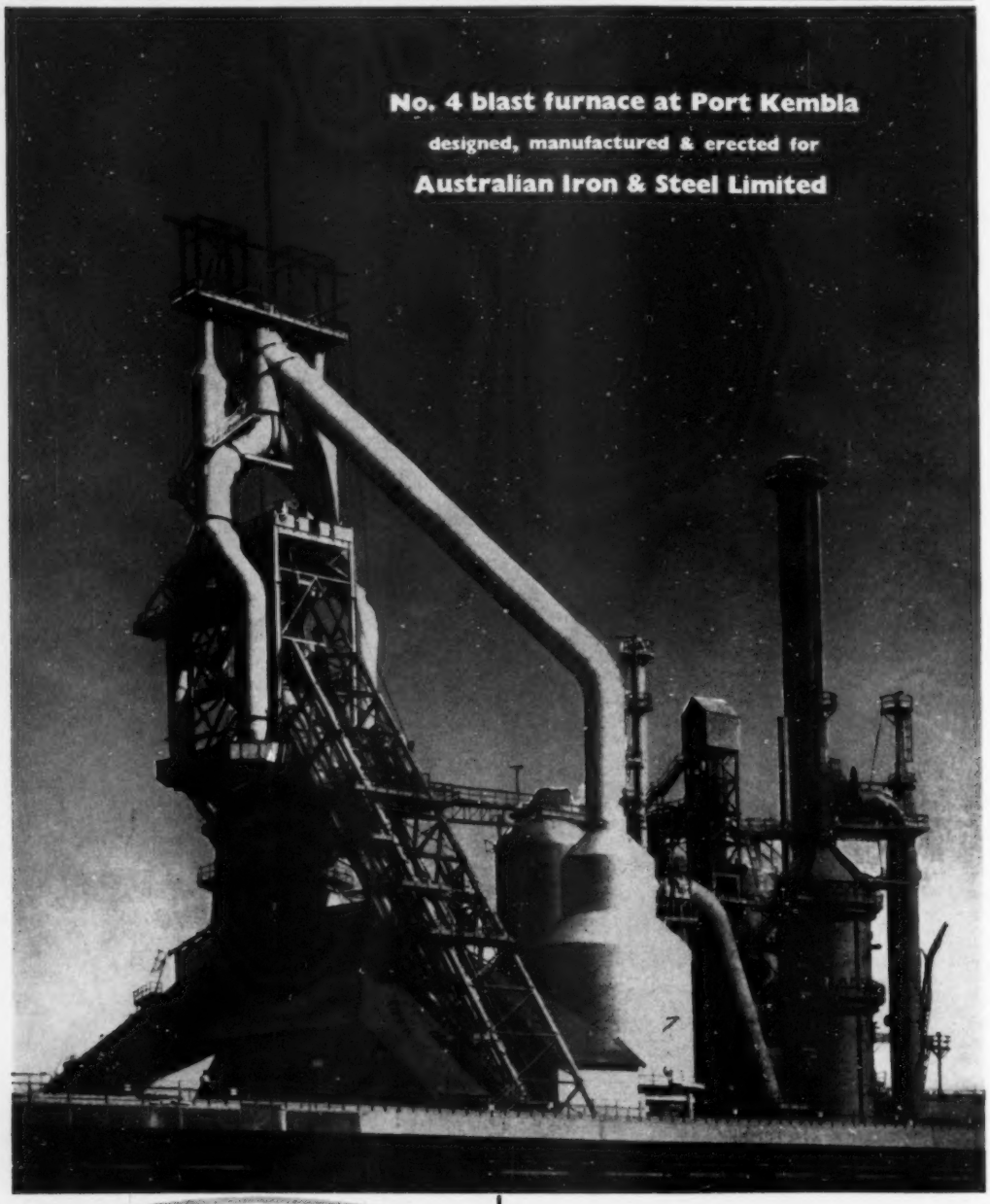
DISTINGTON

DISTINGTON ENGINEERING COMPANY LIMITED



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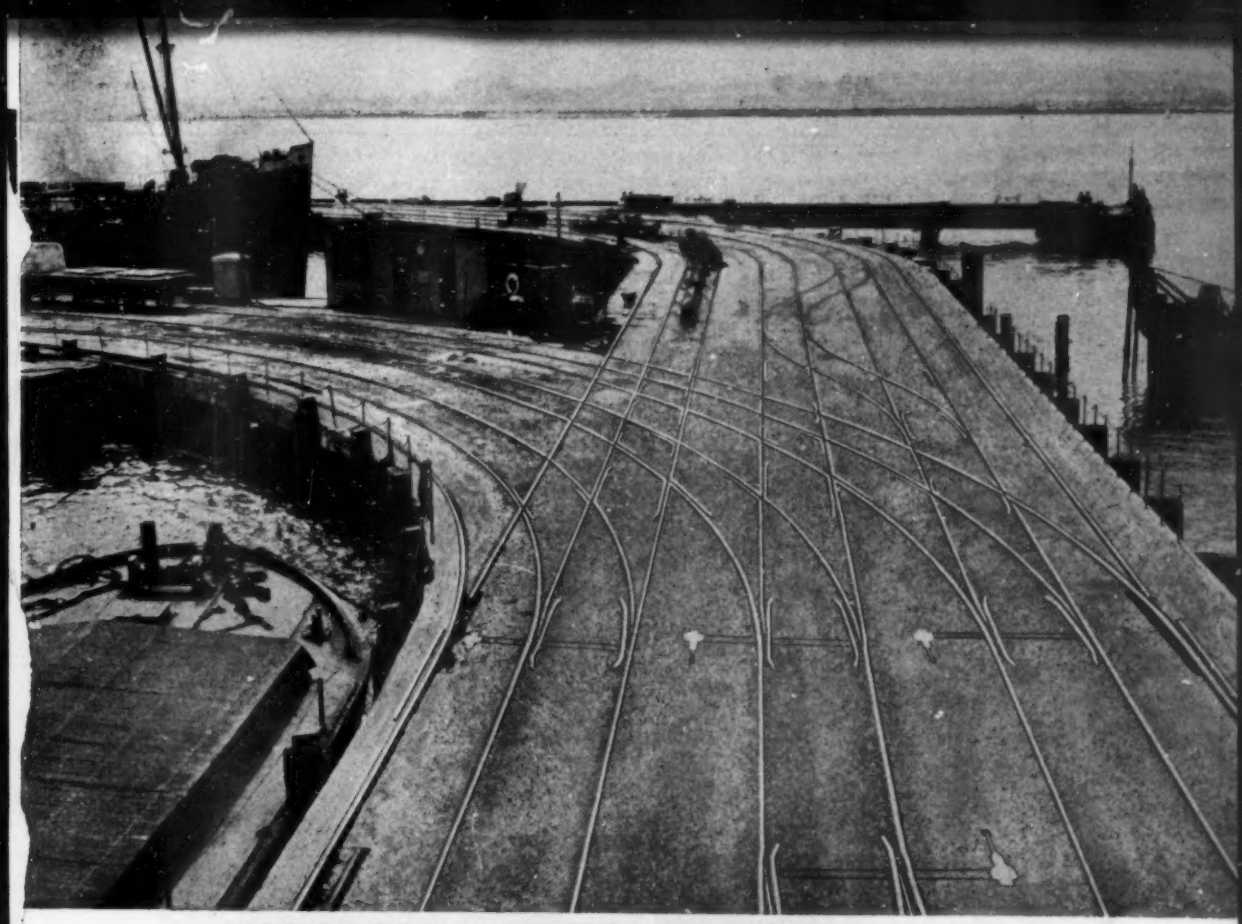


JETTY TRACKS BY SUMMERSON'S

This installation for the Tunnel Portland Cement Company, involved the manufacturing and laying of rail and crane tracks along the new jetty and joining up to existing tracks on the old jetty. The tracks are 75 lb. F.B.B.S. 'R' and 98 lb. F.B.B. Railways section.

The combination joining the new and old jetties to the main access tracks, is a treble junction and Goliath crane track comprising three turnouts, three diamond crossings and thirteen crane crossings, all prefabricated and laid down as a unit at our Works to ensure the minimum disruption to traffic. In addition, six throughroads were manufactured and installed as well as 1,053 yards of straight and curved crane and rail track, most of the crane track angle guarded.

This is yet another example of Summerson's resources and 120 years experience in the design, manufacture and laying of railway sidings.

Main Contractors:
J. L. Kier & Co. Limited
Monberg & Thorsen A/S

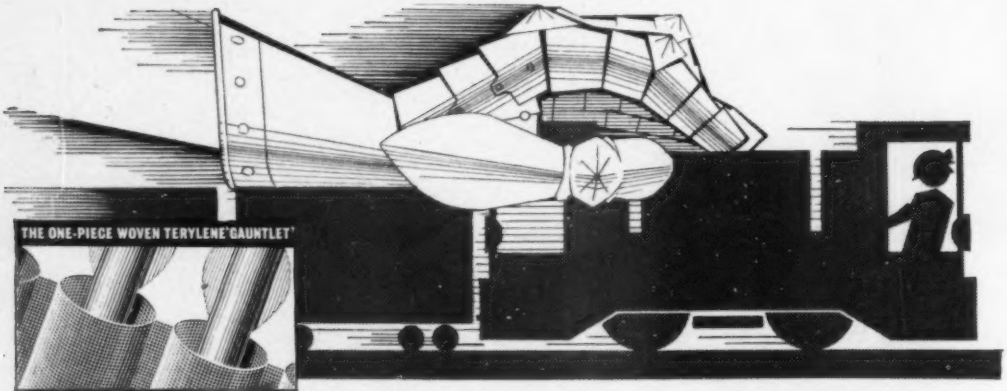
Consulting Engineers:
Sir Alexander Gibb & Partners'

Always consult Summerson first on railway siding problems

THOMAS SUMMERSON & SONS, LTD., MOWDEN HALL, DARLINGTON DARLINGTON 5226

London Office: 5a Dean's Yard, Westminster, S.W.1. Abbey 1365-6-7.

Battery electric mine locos can now work harder and longer between charges



In this patented version of the famous Exide-Ironclad tubular positive plate, a Terylene 'gauntlet' takes the place of slitted ebonite tubes. Terylene possesses physical properties that have made it possible to develop battery compactness, performance and length of life to levels previously out of reach.

'GAUNTLET' plate construction is patented and exclusive to THE NEW Exide-Ironclad BATTERY

The new Exide-Ironclad battery, with its patented 'gauntlet' plate, gives up to 35% more power without increase in battery space. Every battery electric mine loco, as battery replacements become due, can now be equipped to work longer hours or haul heavier loads. The new Exide-Ironclad not only packs more power into the same space, but is livelier in performance and has a greater expectation of life than even Exide-Ironclad could offer till the 'gauntlet' plate was developed.

M.123A

A PRODUCT OF CHLORIDE BATTERIES LIMITED: BACKED BY WORLD-WIDE SERVICE

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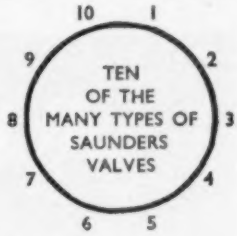

1 Piston Operated
½"—14"

2 Diaphragm Operated
Pressure Opening
½"—6"

3 Lever Operated
Quick Acting 90°
½"—1½"

4 Handwheel Operated
¼"—14"

5 Extended Spindle
½"—14"

6 Plastic Valves
½"—2"

7 Electrically Operated
½"—14"

8 Chainwheel Operated
1½"—14"

9 Diaphragm Operated
Pressure Closing
½"—8"

10 Lever Operated
Quick Acting with
Positional Lock
1½"—4"

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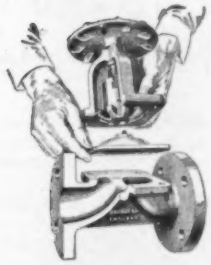
All over the world

- In types to suit many iron and coal trade purposes
- For local and remote control
- For manual and power operation
- With body, bonnet and diaphragm specifications to suit the hundreds of fluids encountered in industry



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- Isolates fluid from mechanism
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- Is readily changed for different duty or for the simplest of all maintenance

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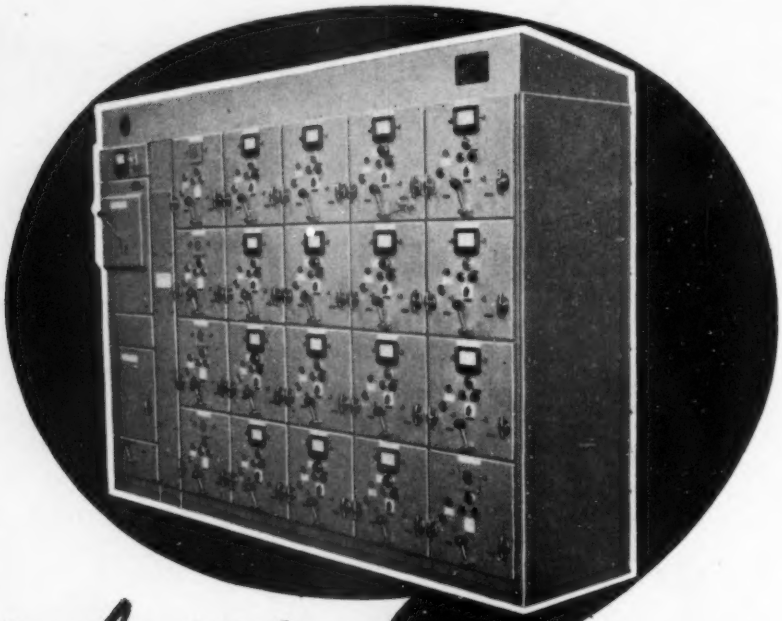

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To **your** requirements
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1. **ACCESSIBILITY**—draw out construction for starters up to 120 h.p. allows complete starter removal leaving no live parts exposed.
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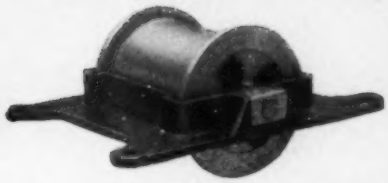
'CY' Multiple Rollers mounted in Malleable Iron Frame



'CY' Rollers to NCB Spec. P110/1954 mounted in Malleable Iron Frame with renewable 'Wynite' bearings. 14 ranges of sizes available, also supplied with Ball or Oilite bearings.

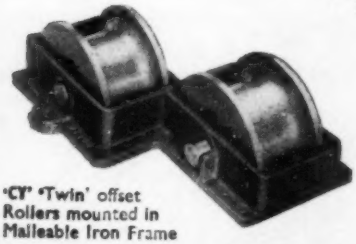
CY

abrasion-resisting alloy outlasts chilled iron by 3-5 times

other applications include STOWAGE & WASHERY, PIPE BENDS & INSERTS & LINER PLATES

'CY' Haulage Surge Wheel Segments

'CY' Brake Blocks for Shunting or underground Loco's



'CY' 'Twin' offset Rollers mounted in Malleable Iron Frame

'CY' Angle Rollers mounted in Malleable Iron Frame

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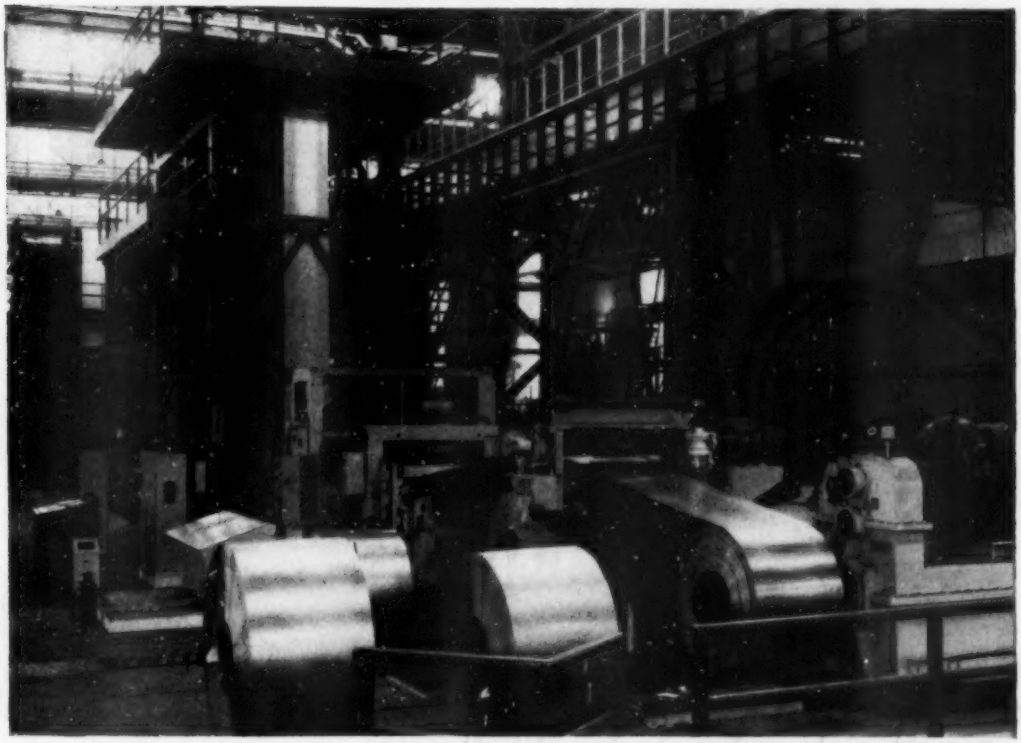
Another Electrolytic Tinning Line for Britain

The sixth Ferrostan electrolytic tinning line of Wean design to be installed in a British steelworks has now been commissioned for operation at the Trostre Works of The Steel Company of Wales Ltd.



WEAN-MILES LTD., designers and builders of equipment for British sheet and tinplate mills, are at present completing the engineering, manufacture and installation of new lines for:—

CONTINUOUS TINPLATE ANNEALING · CONTINUOUS STRIP PICKLING
SHEET SHEARING · SHEET SLITTING · TINPLATE INSPECTION

All this equipment is engineered and built to the designs developed by Wean, and incorporates specialized units of British design. British manufacturing facilities, labour and skill are employed throughout.

Wean-designed pickling, electrolytic cleaning, annealing, tinning, galvanizing and shearing equipment is extensively used throughout the world for processing and finishing tinplate and sheet-mill products, including stainless and silicon steels.

Their experience gained from close co-operation with the steel industries of the world for over 30 years is embodied in the equipment built in Britain by Wean-Miles Ltd.

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ONE OF THE WORLD'S LARGEST MANUFACTURERS OF BLAST FURNACE CARBON . . .

- Greater resistance to attack of iron and slag than any other refractory.
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- Cold crushing strength about four times that of an ordinary firebrick.

have received orders for over 220 Blast Furnace Linings throughout the world

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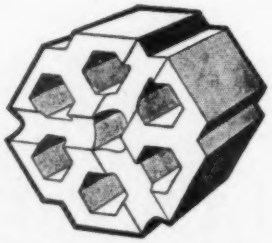
CARBLOX LIMITED, STORRS BRIDGE WORKS, LOXLEY, SHEFFIELD. Tel: Sheff 343844 (5 lines)



★ Carblox Limited now offer the TEMCO pattern chequer brick manufactured by our parent company, Thomas Marshall & Co. (Loxley) Ltd. This new brick has an effective brick mass of 99 per cent.—much higher than any other type of chequer. Details sent on request

One of the MARSHALL REFRACTORIES GROUP of Companies

CX5(R

'Unipruf'

New waterproof explosive

Most Eq. S. explosives for the production of round coal—even the most up-to-date ones—have had one drawback: they could only be used in dry conditions.

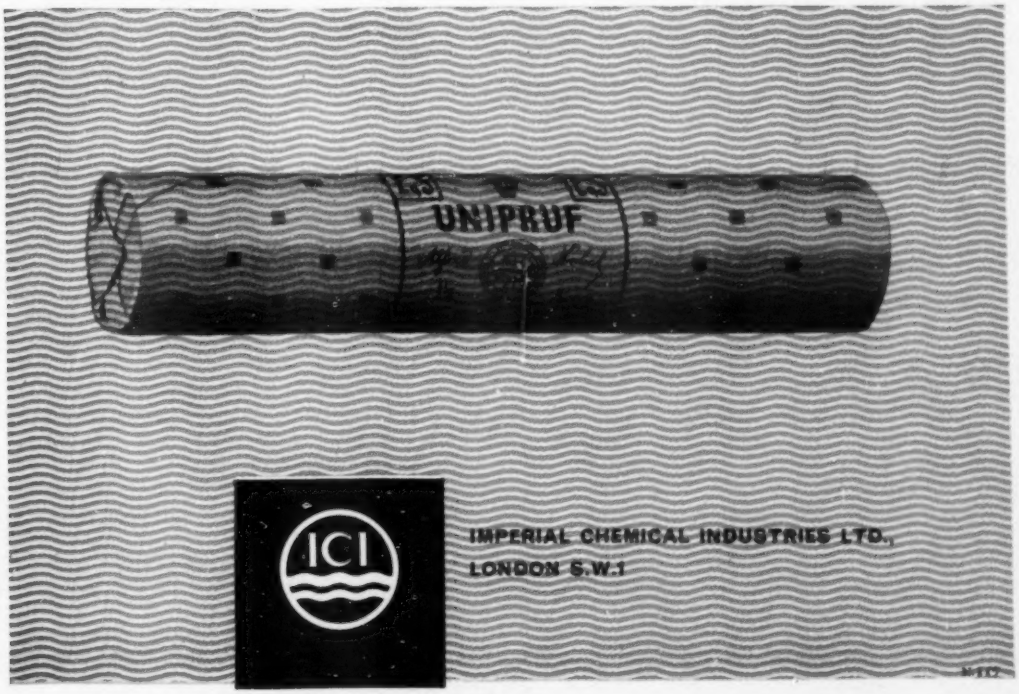
Now I.C.I. announces 'UNIPRUF'—a waterproof equivalent to 'UNIFRAX' that can be used reliably and successfully in naturally damp or wet surroundings.

Tests show that pierced cartridges of 'UNIPRUF' detonate with unimpaired efficiency after 2½ hours complete immersion in water!

'UNIPRUF' joins 'UNIFRAX' to make a team of round-coal explosives available for use *in all conditions.*

'Unifrax'—for dry seams

'Unipruf' —for damp or wet seams



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Make sure you are using the best tool for the job, and the best method of application. Save time and money—use our experience.

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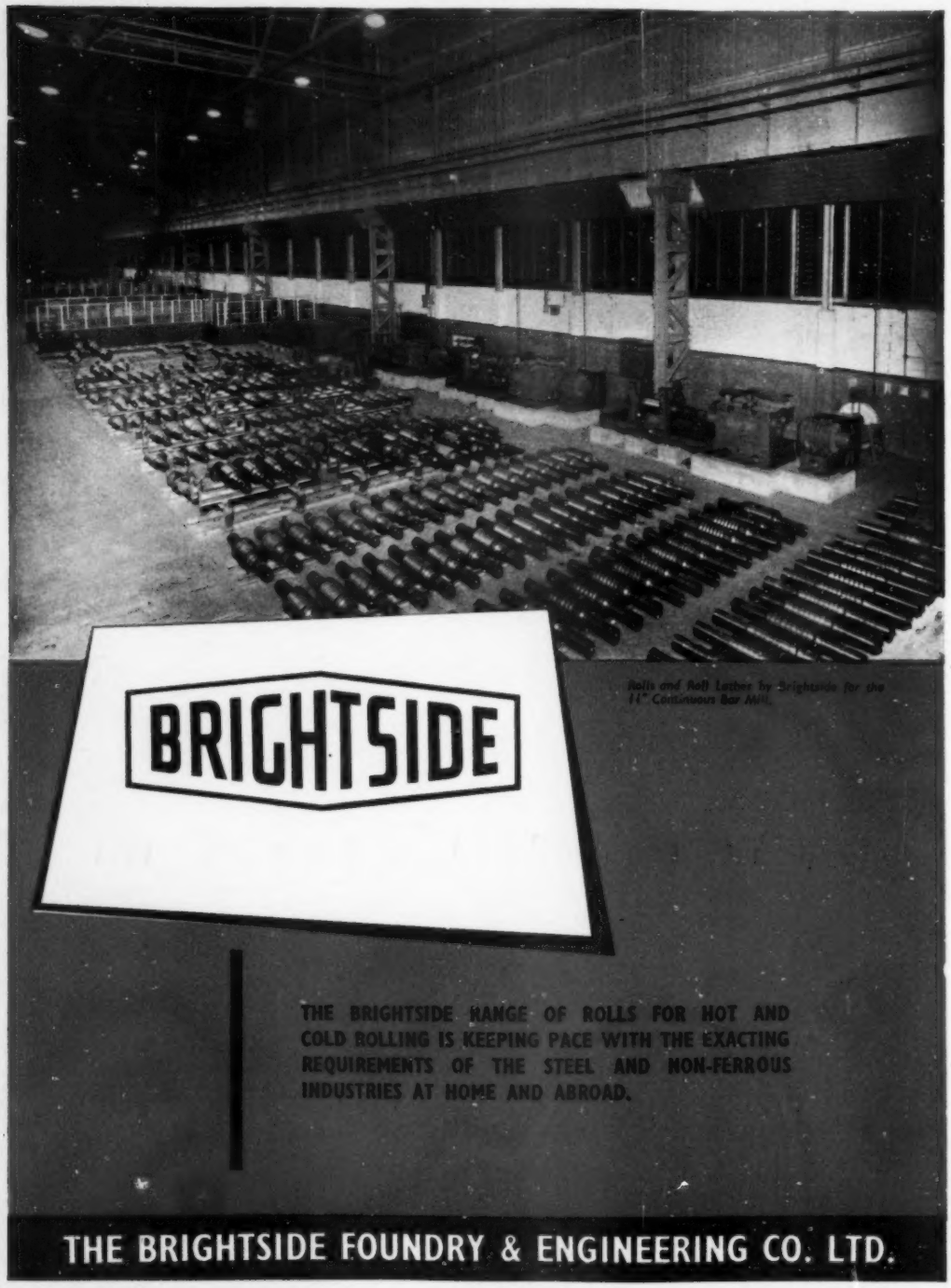
DORMER TOOLS ARE OBTAINABLE FROM YOUR USUAL INDUSTRIAL MERCHANTS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Rolls and Roll Lathes by Brightside for the 11" Continuous Bar Mill.
THE BRIGHTSIDE RANGE OF ROLLS FOR HOT AND COLD ROLLING IS KEEPING PACE WITH THE EXACTING REQUIREMENTS OF THE STEEL AND NON-FERROUS INDUSTRIES AT HOME AND ABROAD.
THE BRIGHTSIDE FOUNDRY & ENGINEERING CO. LTD.

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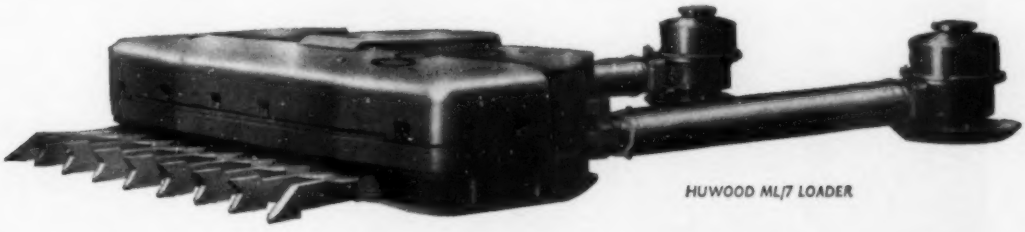
BS 61

NO 'SIXES AND SEVENS'!

The term 'sixes and sevens', which stands for confusion and general mayhem, has acquired an entirely new meaning since the introduction of the Huwood ML/7 Loader. With its slightly older and taller sister, the ML/6, it is making a formidable attack on the problem of low seam mechanisation. The ML/6 is 1′ 9″ in height, the ML/7 is 1′ 4½″ in height and of slightly greater width. Both offer the advantage of requiring a low capital investment appropriate to the seams in which they are used. Both minimise coal degradation. Both are hydraulically propelled and both are noted for quiet and efficient production.

The difference between 'sixes and sevens' and 'ML sixes and sevens' is something much appreciated in the mining industry of today.

HUWOOD ML/6 LOADER ON THE FACE



HUWOOD ML/7 LOADER

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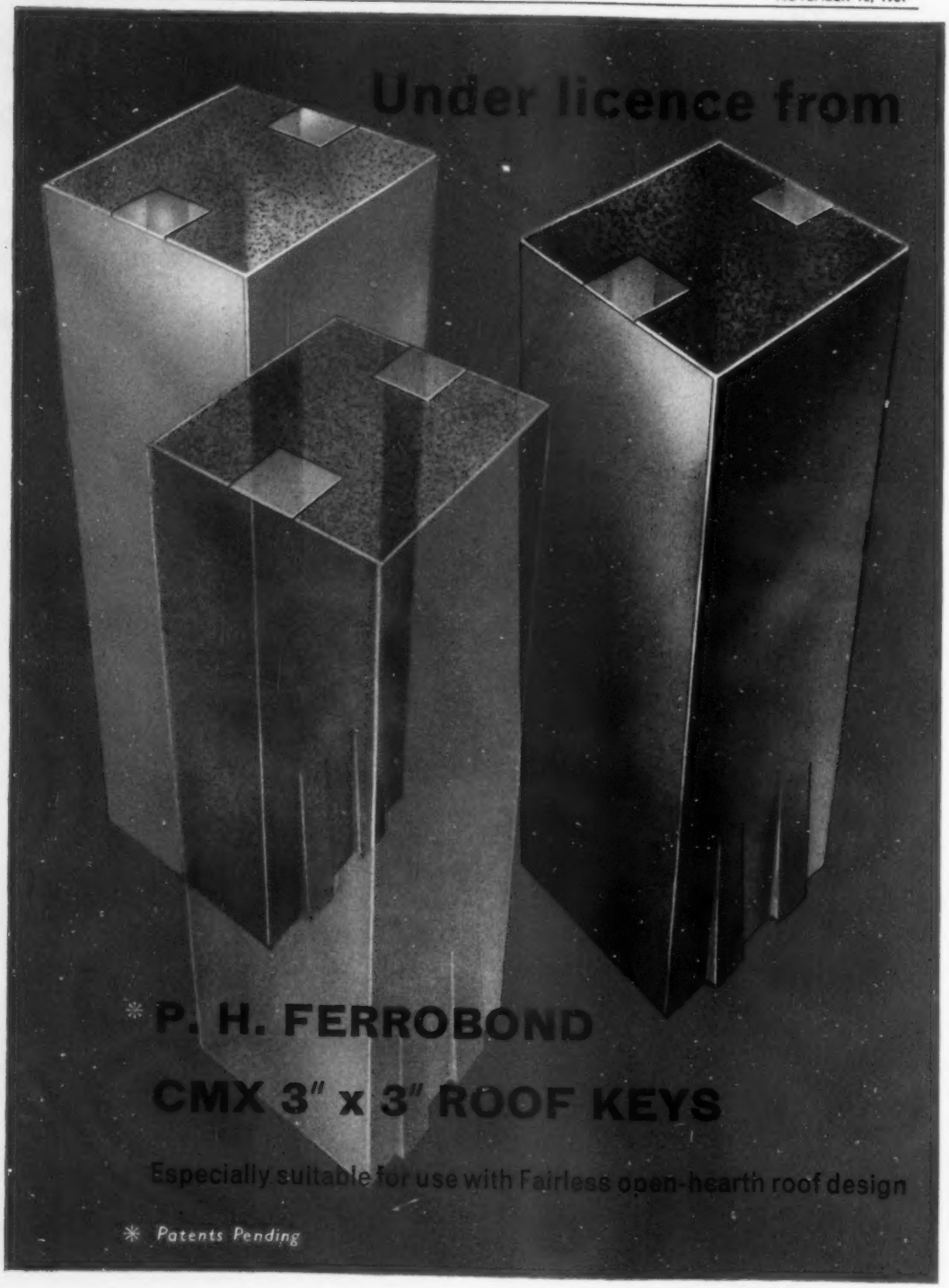
ML/FA/235


Under licence from
* P. H. FERROBOND
CMX 3" x 3" ROOF KEYS
Especially suitable for use with Fairless open-hearth roof design
* Patents Pending

America, Pickford Holland are now making to-day's most successful basic roof keys

The P.H. Ferrobond CMX 3" x 3" Roof Key is a new, metal-clad, chemically bonded basic open-hearth brick without internal plates, designed by E. J. Lavino & Co. of Philadelphia for maximum service and economy. A series of comparative tests with internally plated 4½" x 3" keys proved Ferrobond to be always equal, and usually superior, in performance. They are light and easy to handle, have built-in hot face expansion, and tabs ensure correct alignment. In addition, saving on material cost by rib and valley construction makes the P.H. Ferrobond beyond doubt today's outstanding value in basic roof brick. Considering a trial? Send drawings of your present roof to Pickford Holland who will redesign to suit Ferrobond bricks, and give you the assistance of a service engineer for installation.

See how split-roof tests prove OUTSTANDING PERFORMANCE by new FERROBOND ROOF KEYS

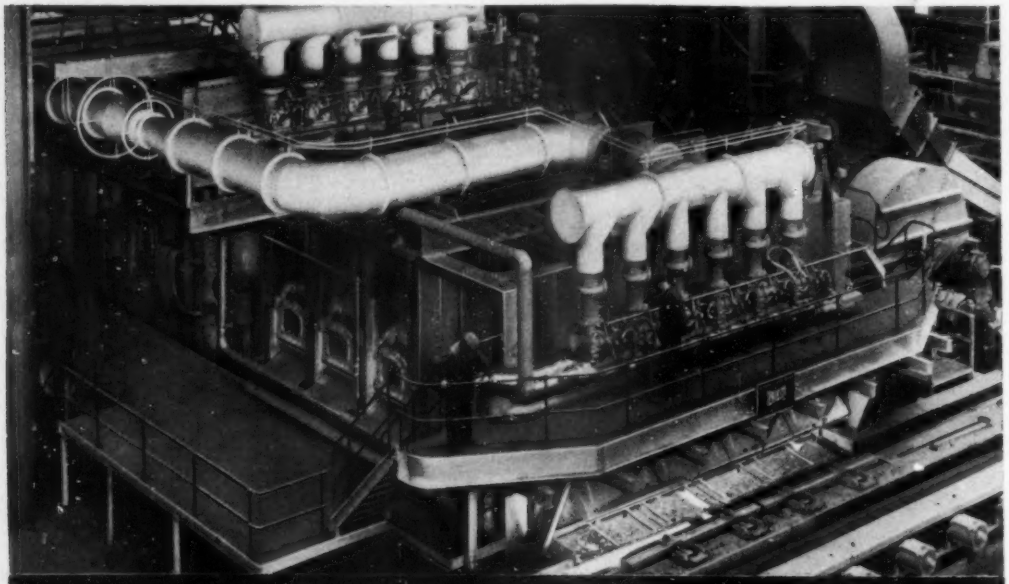
Furnace Capacity	Construction of Roof	Campaign Life	Total Tonnage Produced	Tons/ Hour	% AREA PATCHED		Oxygen Lances through Roof
					Lavino Ferrobond CMX 3" x 3" Keys	Metal Cased Internally Reinforced 4½" x 3" Keys	
190 Tons	12" Rib 9" Valley	284 Heats 112 Days	54,000 Tons	20	1.8%	1.8%	2
190 Tons	12" Rib 9" Valley	256 Heats 75 Days	47,500 Tons	26	2.2%	12.6%	2
190 Tons	All 12"	495 Heats 139 Days	77,000 Tons	25	62%	67%	2
200 Tons	15" Rib 12" Valley	488 Heats 196 Days	100,000 Tons	21	2.6%	6.6%	NONE
345 Tons	15" Rib 12" Valley	453 Heats 178 Days	157,000 Tons	38.5	10.4%	19.0%	2
400 Tons	15" Rib 12" Valley	298 Heats 186 Days	120,000 Tons	27	NIL	NIL	2

This chart shows comparative performance records in North America of six typical open hearth roofs. In each case the roof was constructed half-and-half of Lavino Ferrobond CMX 3" x 3" Roof Keys and Internally Plated 4½" x 3" Roof Keys. All were of the Fairless type roof construction (hold-up, hold-down). Production rate of tons per hour is based on total production over campaign time, and includes repair times, fettling times, and all lost time whatever the cause.

P.H. Ferrobond Roof Keys are manufactured under licence from E. J. Lavino & Company, Philadelphia, U.S.A. by

PICKFORD HOLLAND

PICKFORD, HOLLAND & COMPANY LIMITED, 381 FULWOOD ROAD, SHEFFIELD 10, TEL: 33921



PRIEST OIL FIRED CONTINUOUS BLOOM REHEATING FURNACE

The illustration shows a Three Zone Furnace for reheating 7" or 8" square blooms 15 feet long from cold to rolling temperature at a steady rate of 40 tons per hour. Installed at the Hallside Works of Clyde Alloy Steel Company.

We specialise in the design and construction of:—

Open Hearth Furnaces.

Soaking Pits of all types.

Stress Relieving Furnaces

Continuous Multi-zone Bloom and Slab Re-heating Furnaces.

Continuous Bogie type Ingot and Slab Heating Furnaces.

Furnaces for Aluminium Melting, Coil Annealing and Slab Re-heating.

Forge and Heat Treatment Furnaces.

Shipyard Plate and Bar Furnaces.

Modern Lime Burning Kilns.

PRIEST

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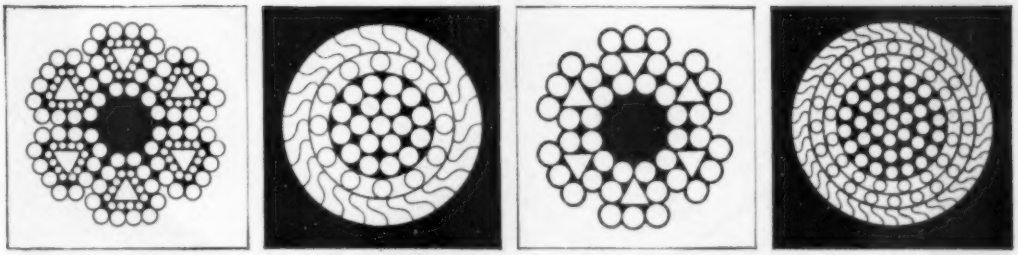
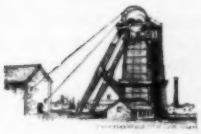
"Glover's Best"



STEEL WIRE ROPES *for all purposes*



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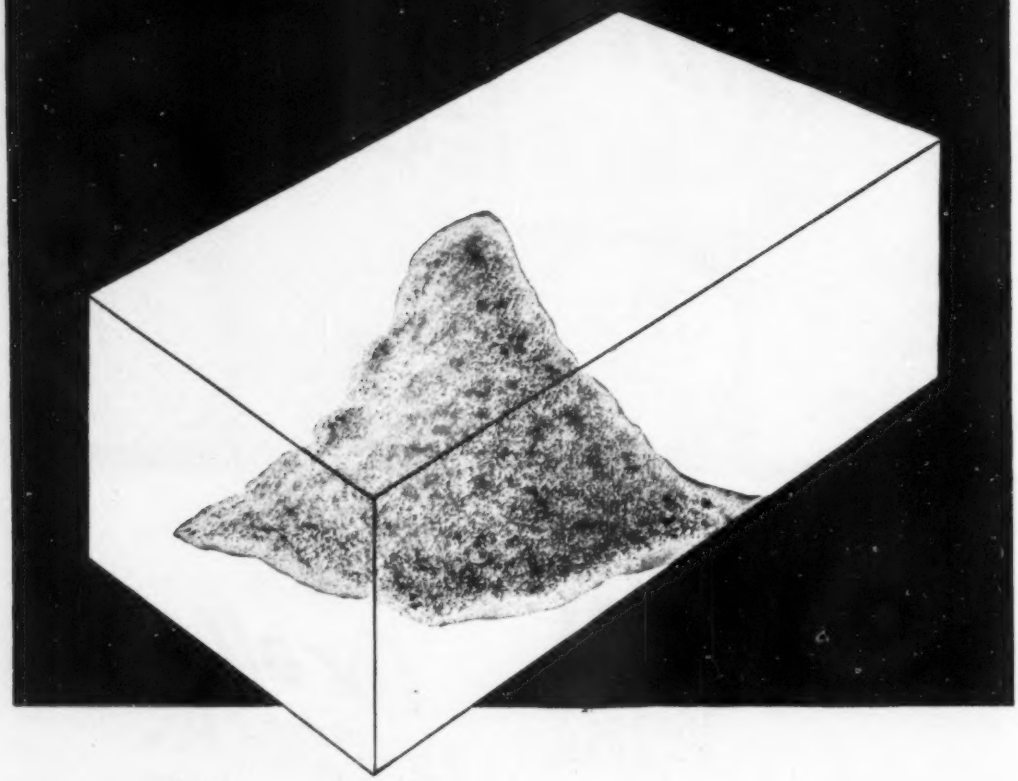
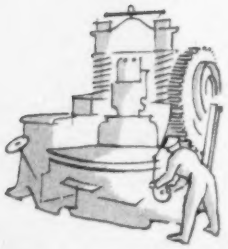
Want to make something of it?





As well as making top quality sand lime, concrete and refractory bricks, the Sutcliffe, Speakman EMPEROR Press makes bricks from clinker, burnt shale, slag, etc. – once considered useless waste. They're good quality bricks, consistent and always well formed.
The EMPEROR Press comes in various sizes – the Duplex exerts a pressure of 200 tons and can make 3,000 bricks an hour, operating round the clock. Sutcliffe, Speakman are specialists in this type of work. They supply a complete range of plant and equipment, and can undertake the erection of complete brickworks and hand them over in working order. And they are always happy to advise you.

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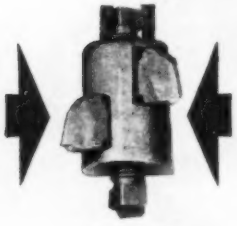

only 3 1/4" kerf

HOY THIN KERF chains are of the well-tried Multipic design and have ample strength for modern 80 h.p. coal-cutting machines but

they cut a kerf of only 3¼ ins.

In a thin seam this means a considerably smaller percentage of the coal is produced as kervings and a greater percentage as +2 ins. coal. The smaller gum pile improves face ventilation.

● ASK FOR NEW DESCRIPTIVE BROCHURE ●

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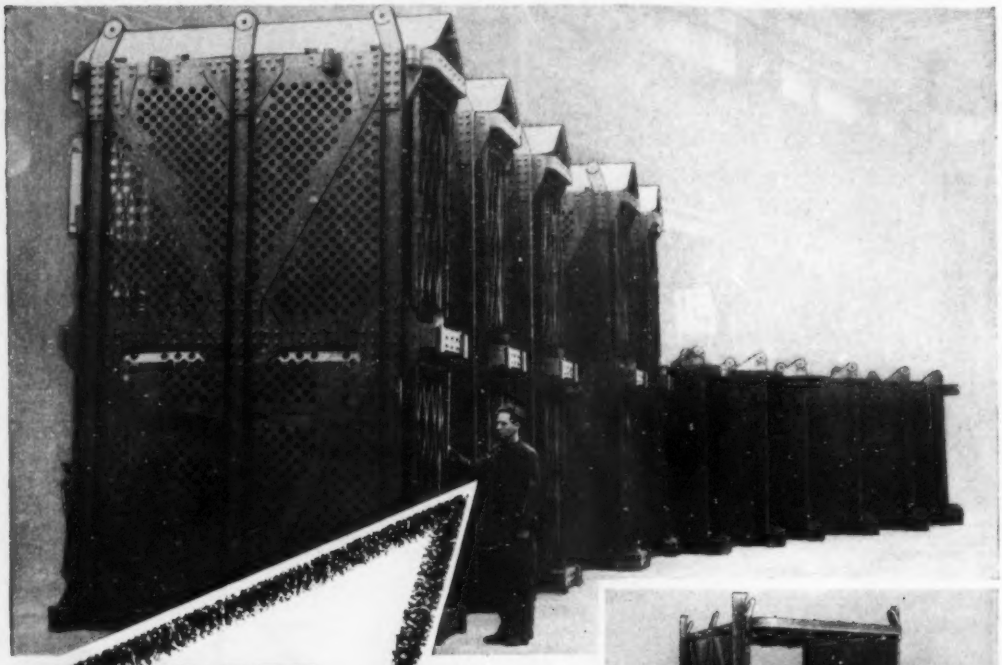
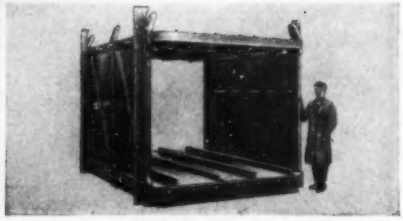
coal cutter chain

T.K.1.





PIT CAGES

Pit Cages are but one of the many items produced by The Lilleshall Company for the Mining Industry. The Lilleshall Company's Engineering Division undertakes the design, supply and erection of all types of structural and mechanical equipment, including conventional and prefabricated buildings, headgears, conveyors, bunkers, new electric winders, haulages, and winches, also conversions and repairing existing winders. Other Lilleshall activities include glazed sanitary ware, such as wash basins, W.C. pedestals, urinal stalls, glazed bricks and channels, and also concrete and timber products.

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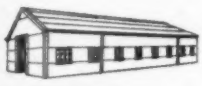

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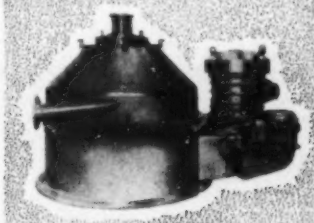

PUBLICATION No. G.6018

SCREENING

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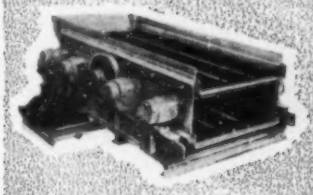
This full-floating screen has proved efficiency for course and medium high output screening over long periods. Massive rubber mountings withstand shock loading of heavy materials ensuring long life with little maintenance.



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HANDLING

CONVEYORS

Equipment for bulk materials handling, comprising belt and vibro conveyors, gravity bucket conveyors, BEAUMONT skip hoists and drag scrapers.

PUBLICATION No. M.5810

PUMPING

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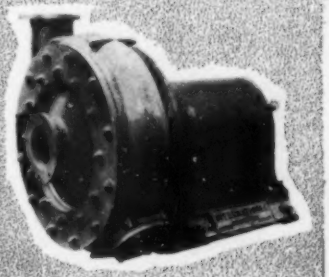

PUBLICATION No. G.611

The four items of equipment illustrated here are representative of the wider range available from International Combustion, meeting a great variety of industrial applications.

Fully detailed illustrated brochures are available on request.

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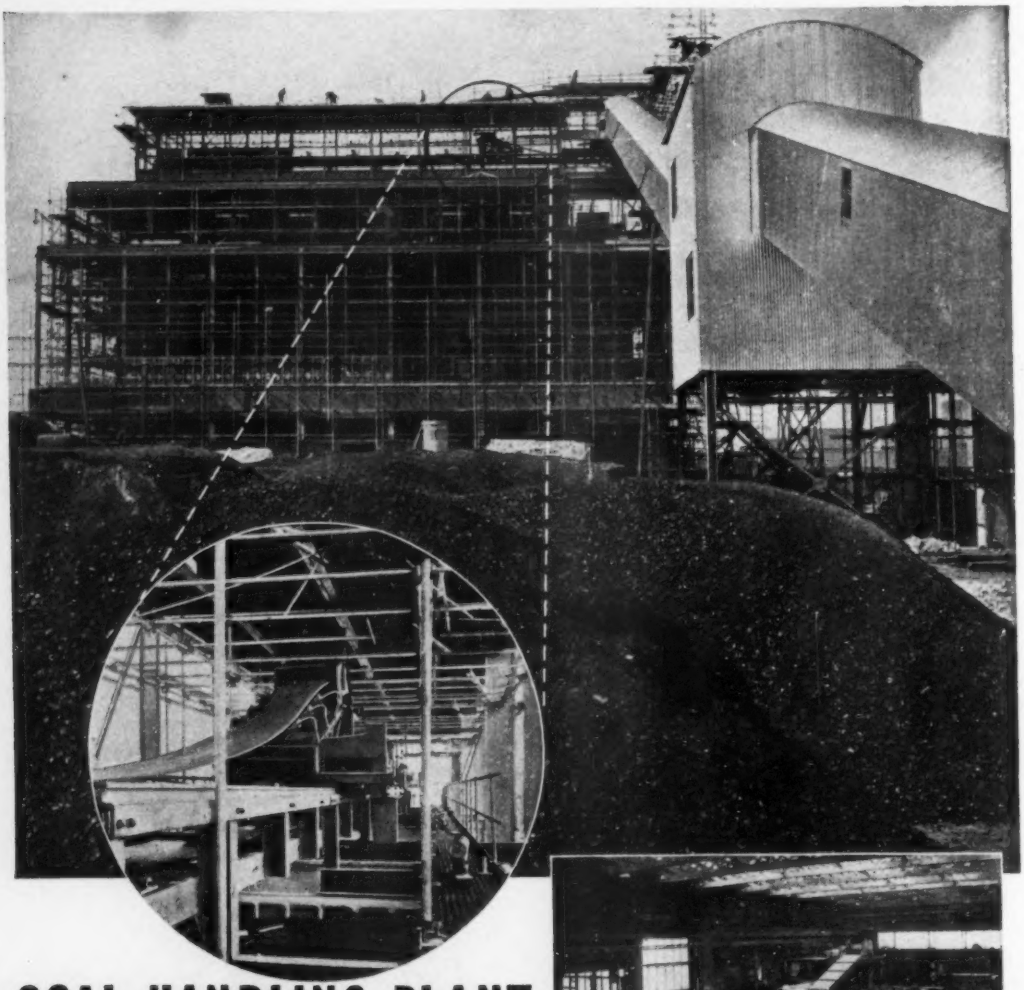

COAL HANDLING PLANT

Illustrated above, during construction, is the boiler house at Messrs. Courtaulds Ltd. new Grimsby factory. The coal conveying plant was manufactured by John Thompson Conveyor Co. and handles 100 tons an hour, receiving from both rail and road transport, feeding boiler house bunkers via a distributing conveyor and automatic tripper.

We are able to design and manufacture coal conveying machinery for every purpose carrying the job through from drawing board to site.

John Thompson Conveyor Co. fabricated and manufactured twin apron plate conveyors, each 60 ft. long by 7 ft. wide to the design of Davy & United Ltd., for the Dorman Long rod and merchant mill.

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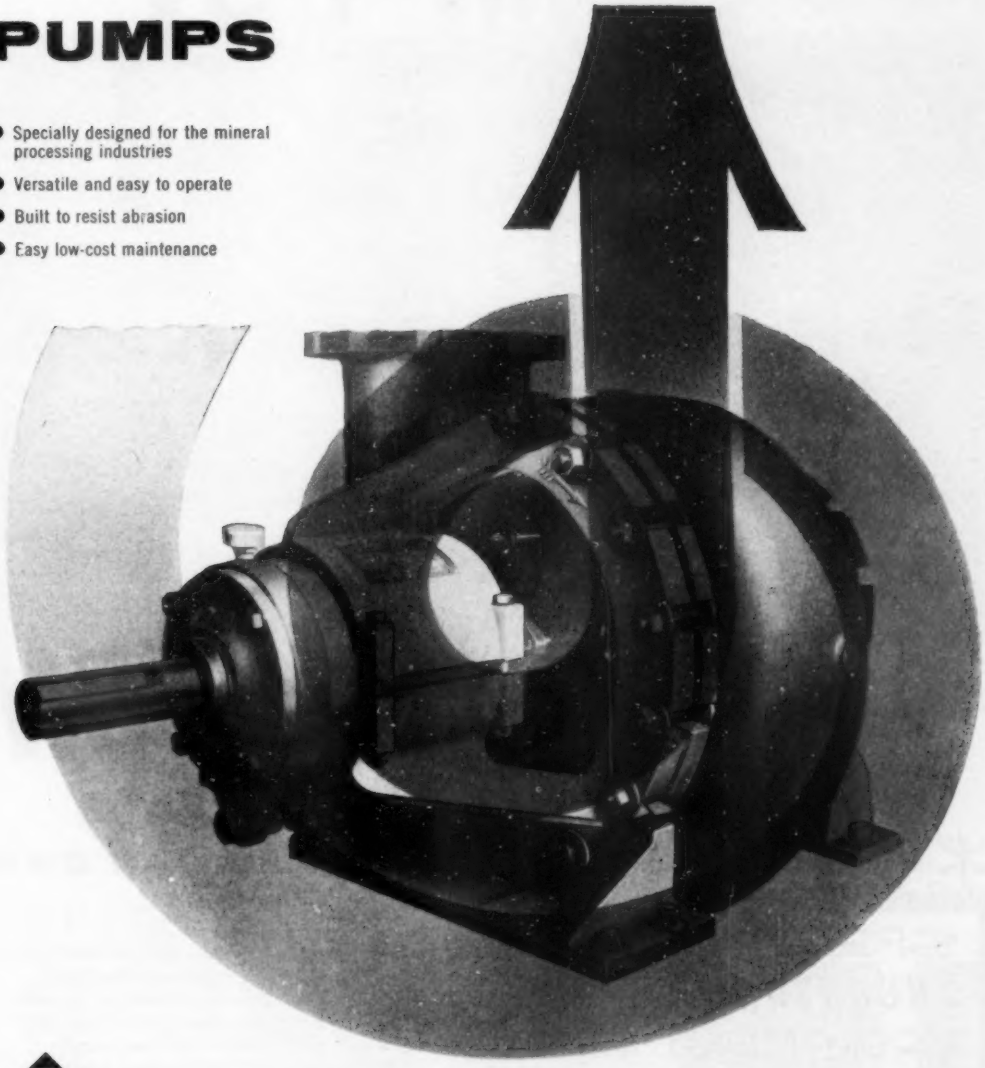

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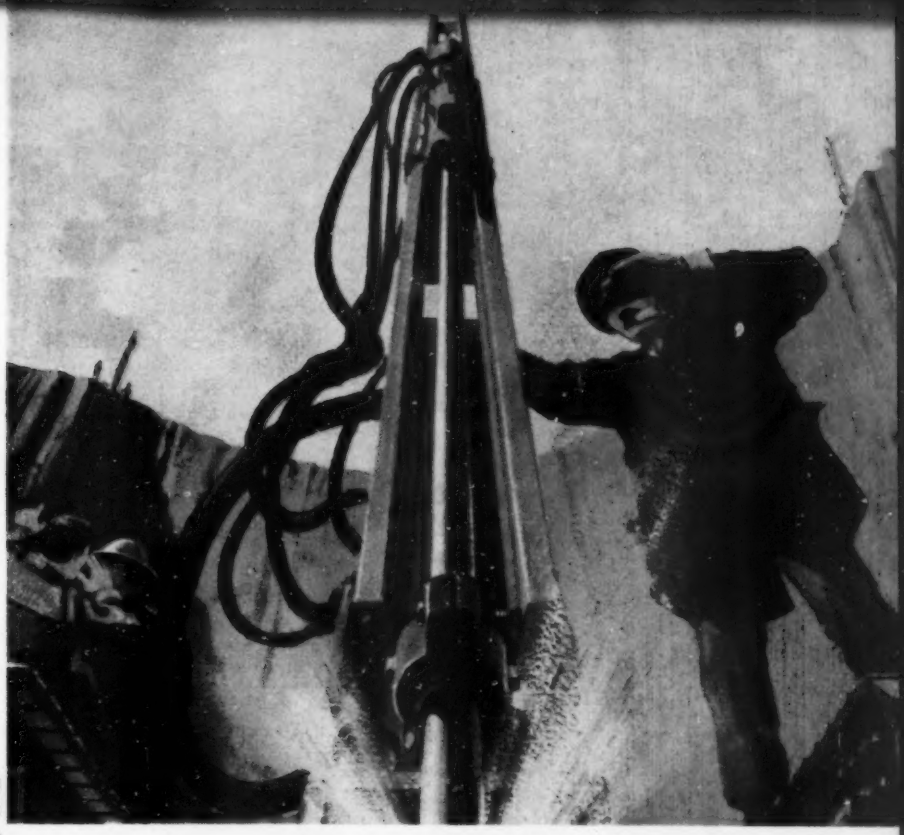

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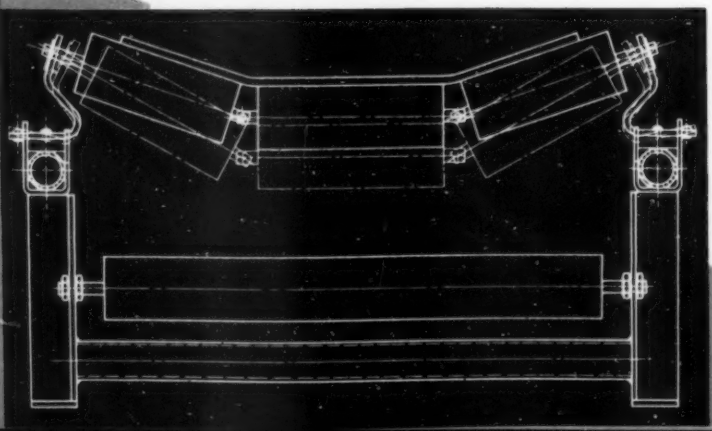

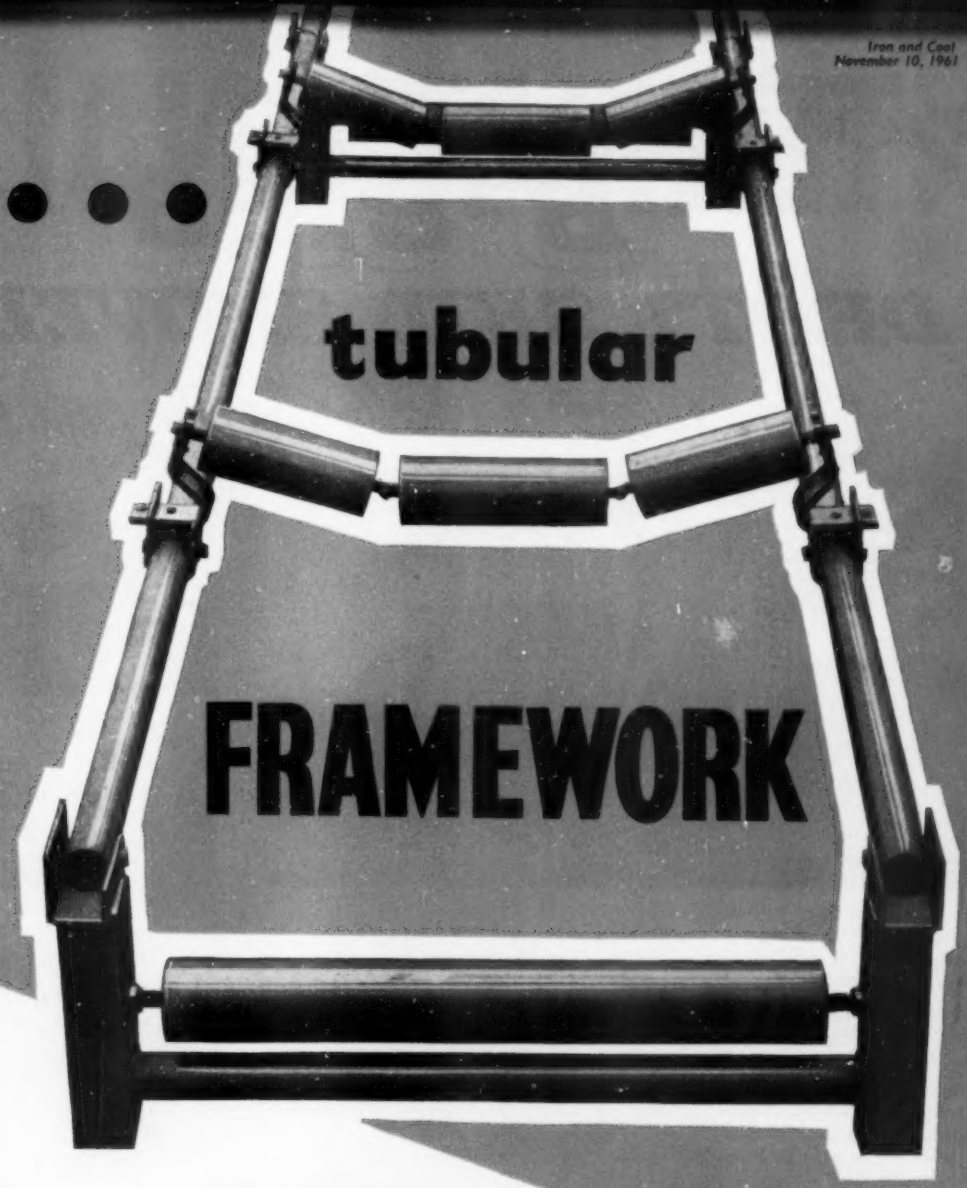

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1. Seams 22 in. to 46 in.
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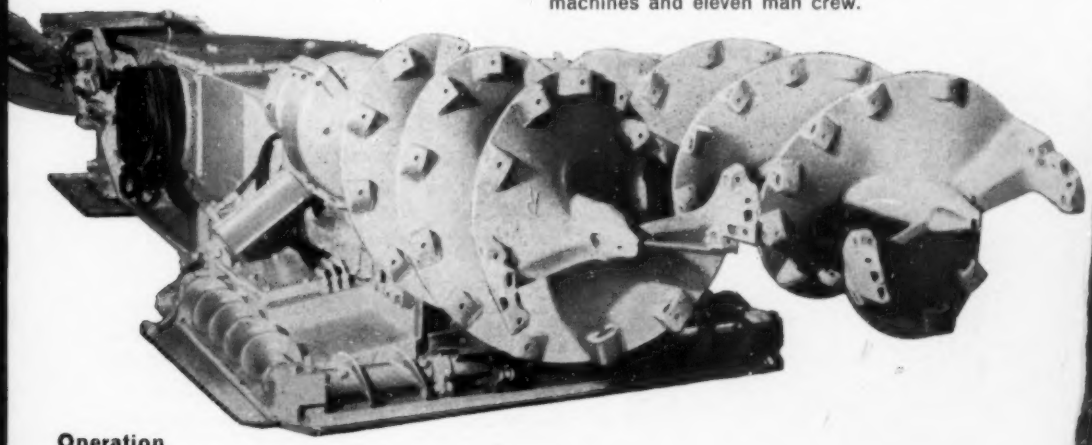

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1. Motor driven augers through reduction gearing rotating in opposite directions—forward oscillation prevents coal binding.
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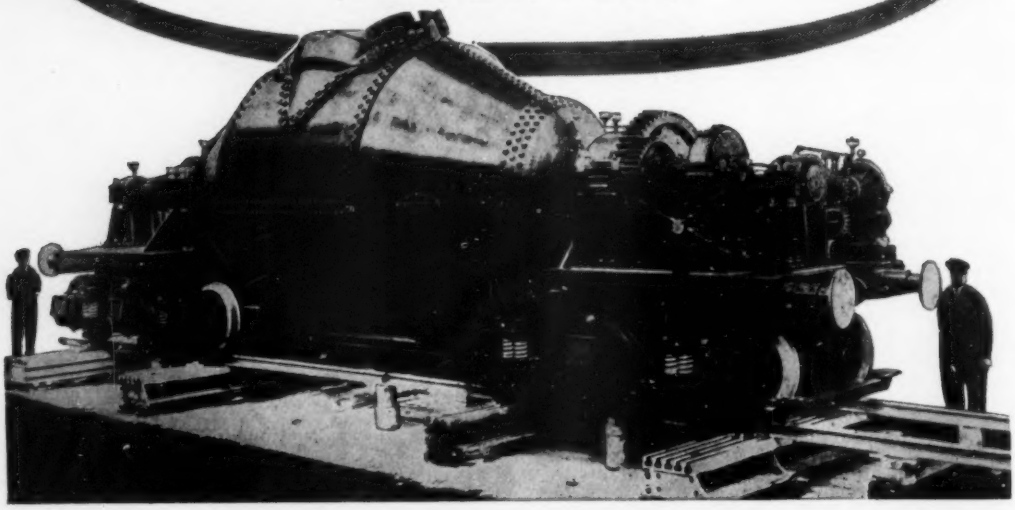

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COAL remains COAL, then, but IRON becomes STEEL. When this journal was born, Bessemer's great discovery was but ten years past, and no thought then arose of nailing steel's colours to our masthead. But from now on let there be no doubt; STEEL & COAL believes in steel, will blazon to the world the benefits of steel. It will be the journal for the *user* as well as the *maker* of steel; new methods of manipulating it, new products incorporating it, new processes employing it—all will be fully and expertly treated.

In tune with these shifts of stress we plan many a change in presentation. A larger page has been long requested and recommended by those who purchase advertising space and those who design material to fill it; we are glad to be able to fulfil our own plans and their wishes simultaneously. In the interests of the busy executive we are radically restyling the layout and type of the journal; numerous innovations will be aimed at making features more rapidly located, data more easily assimilated, indexing more complete. The standard of presentation of STEEL & COAL will be as high as that of any specialist journal in the world.

And so we step out towards our century, and, doubtless, our second century. Mind cannot conceive of a time when the technique and practice of coal winning and utilization, of iron and steel manufacture and manipulation, will be able to dispense with their own specialist literature. Always will there be experience to be shared, information to be disseminated, data to be evaluated. STEEL & COAL will proudly bear these responsibilities, for its blueprint for progress is firmly founded on a heritage of achievement.

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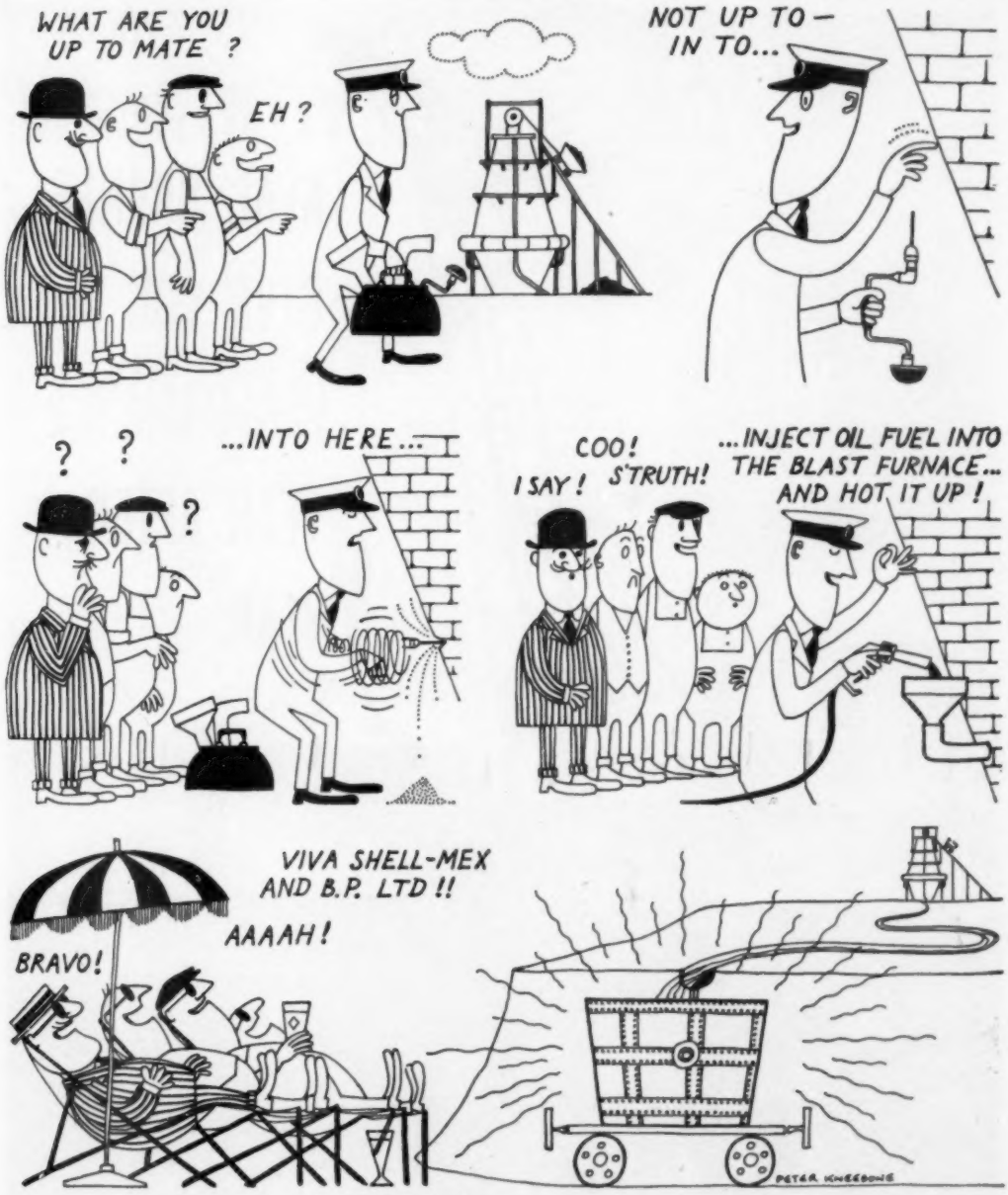

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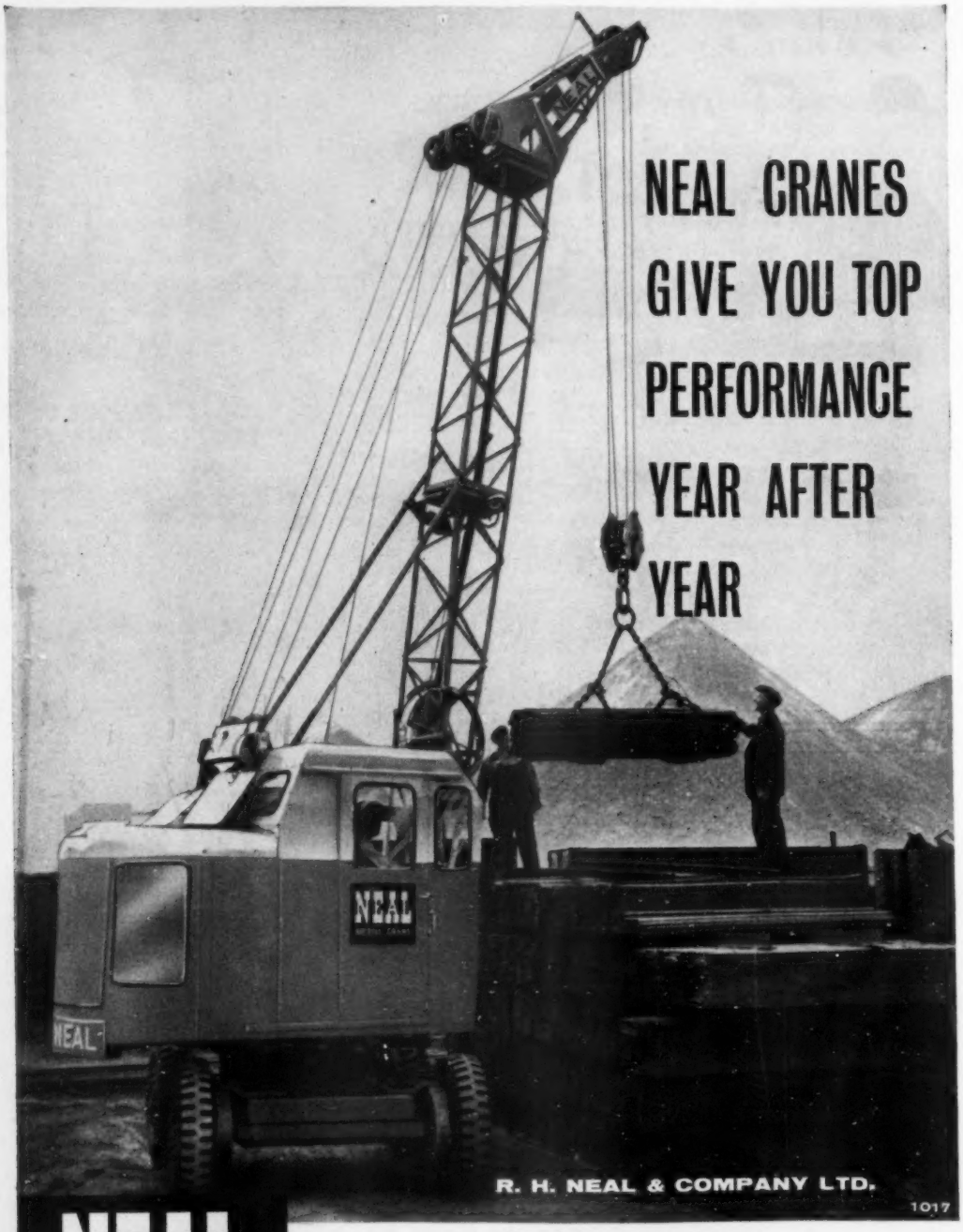

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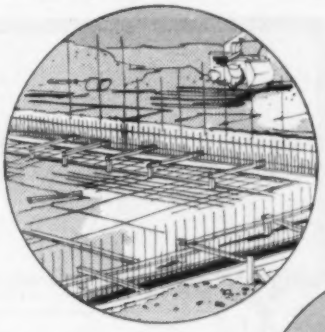

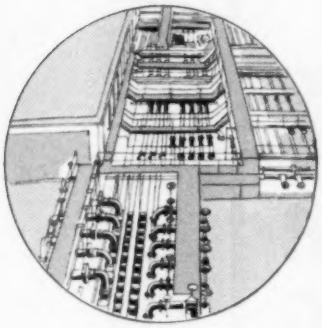

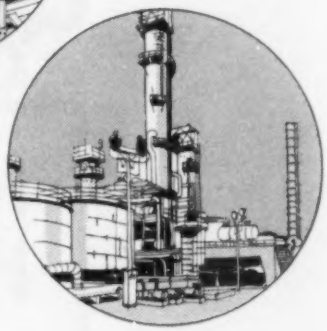

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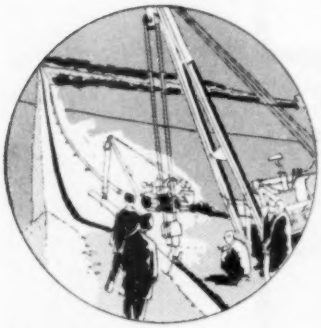

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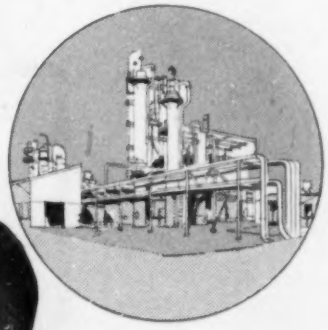

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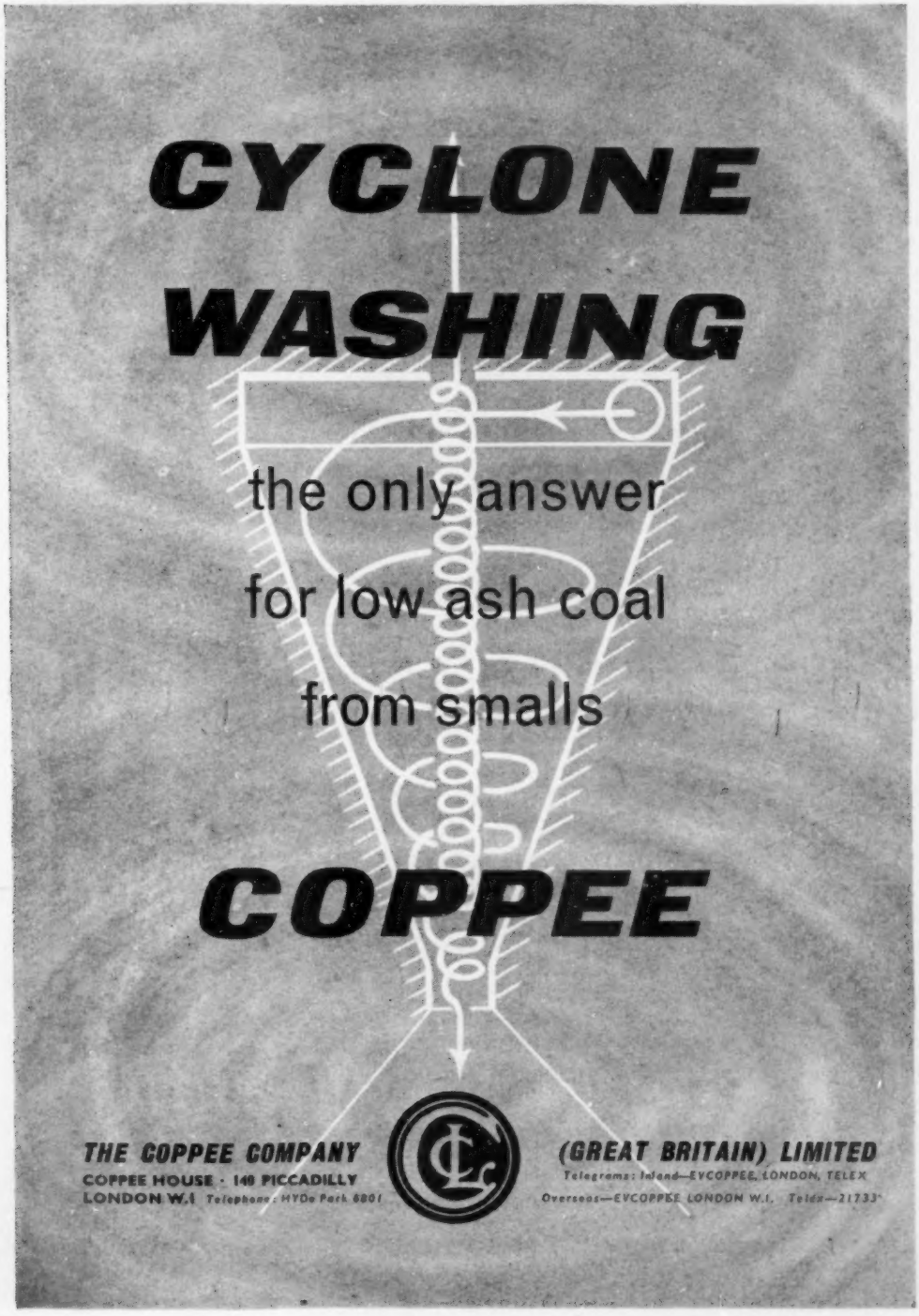
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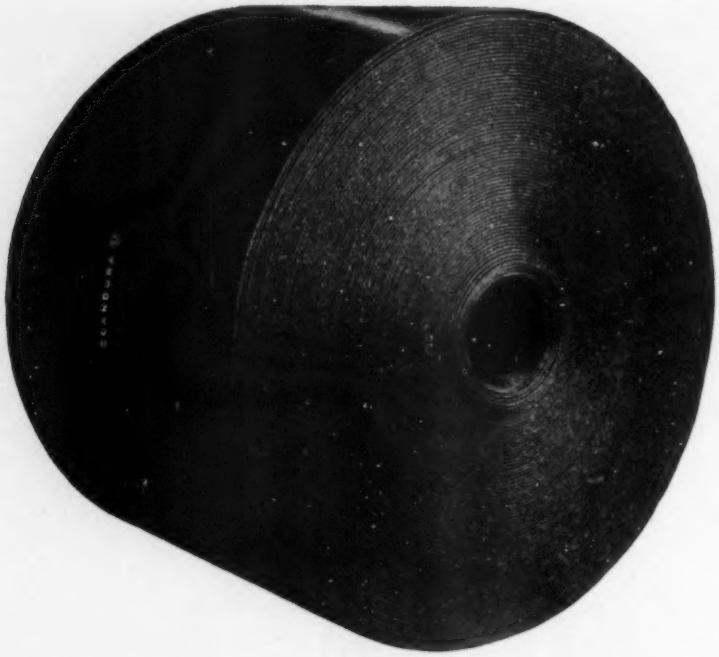

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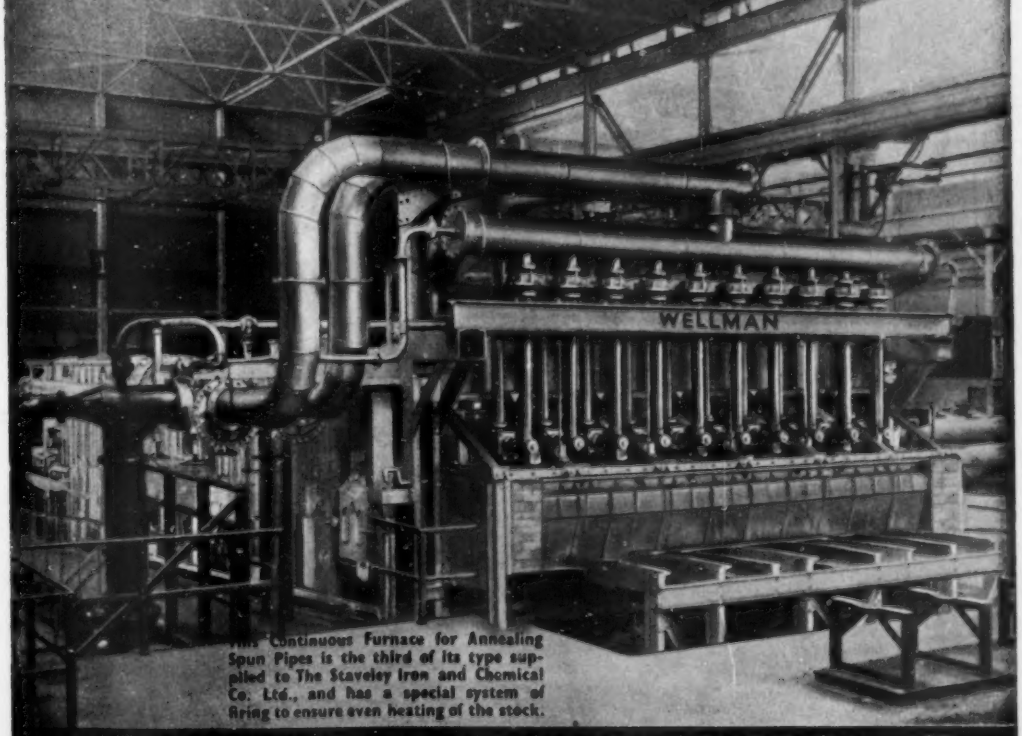

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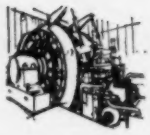

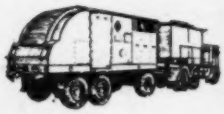

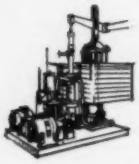

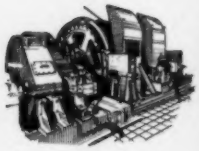

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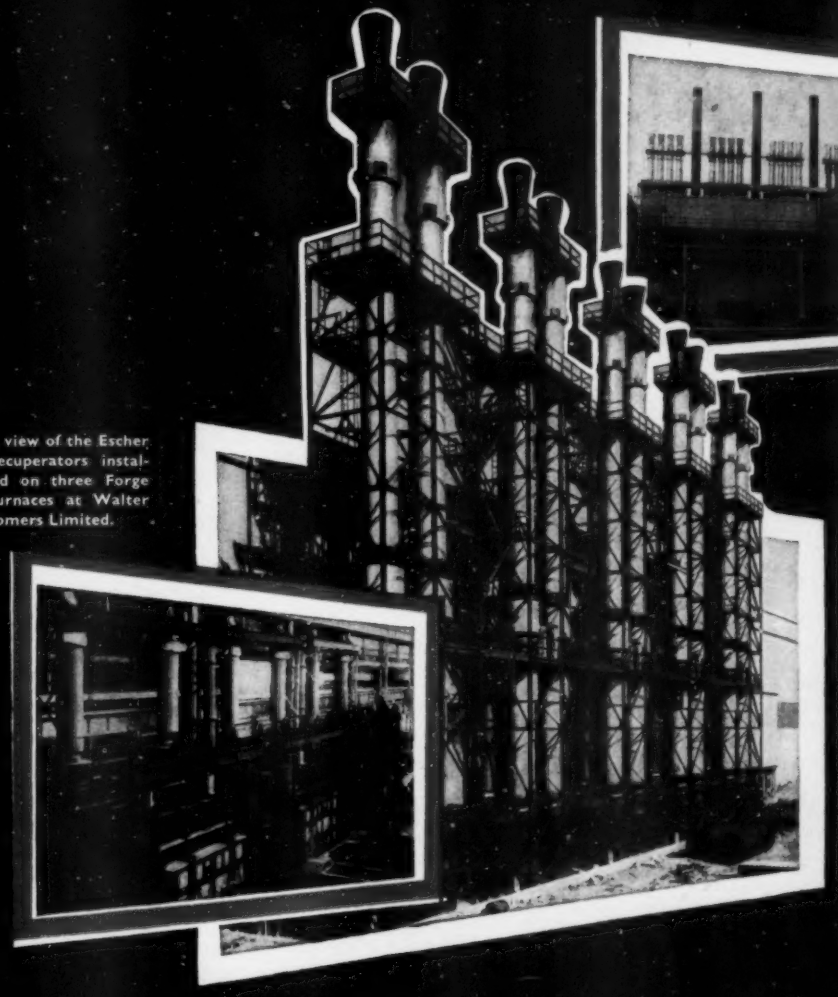

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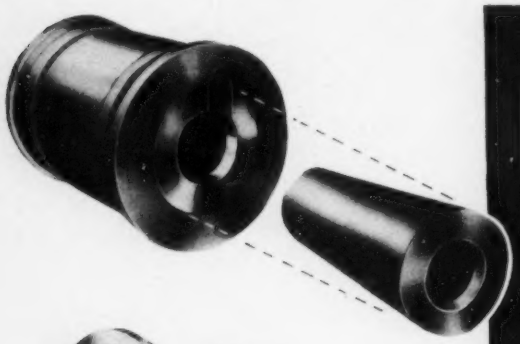

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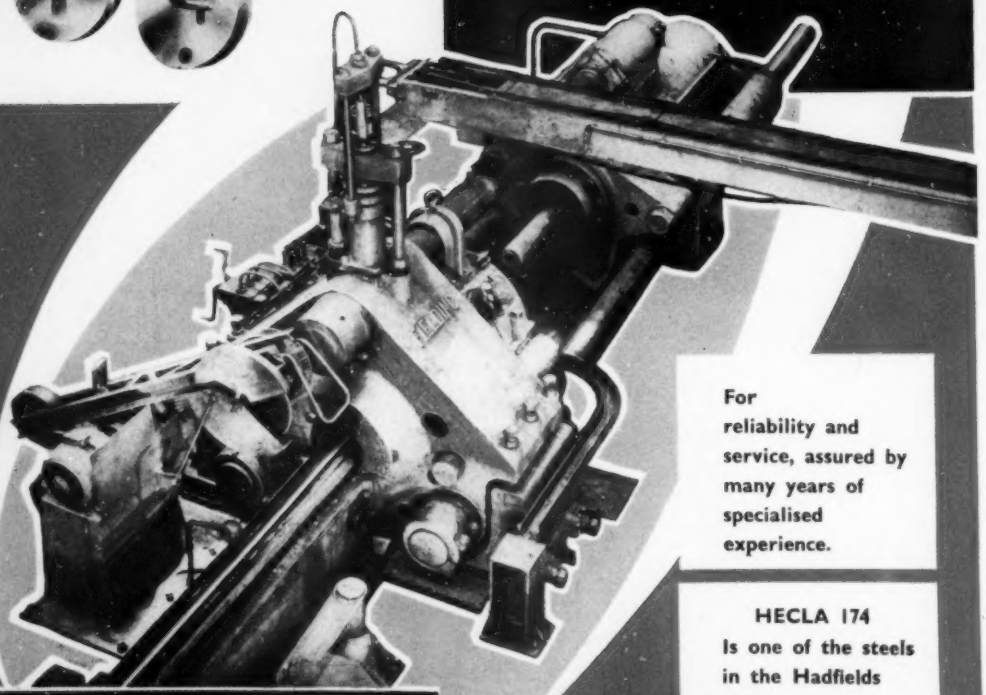

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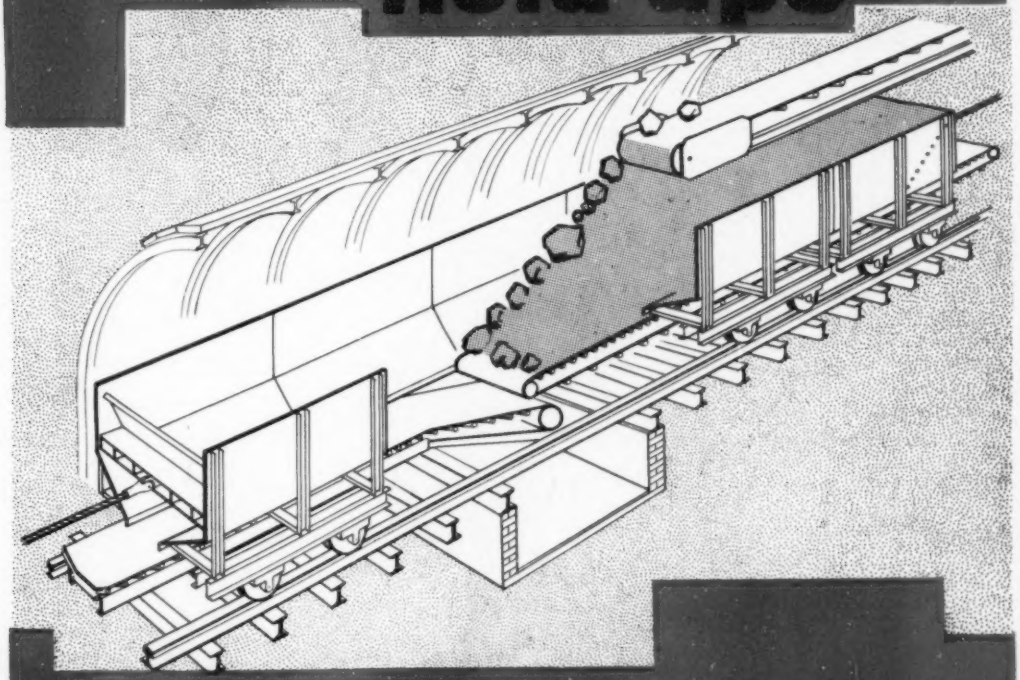

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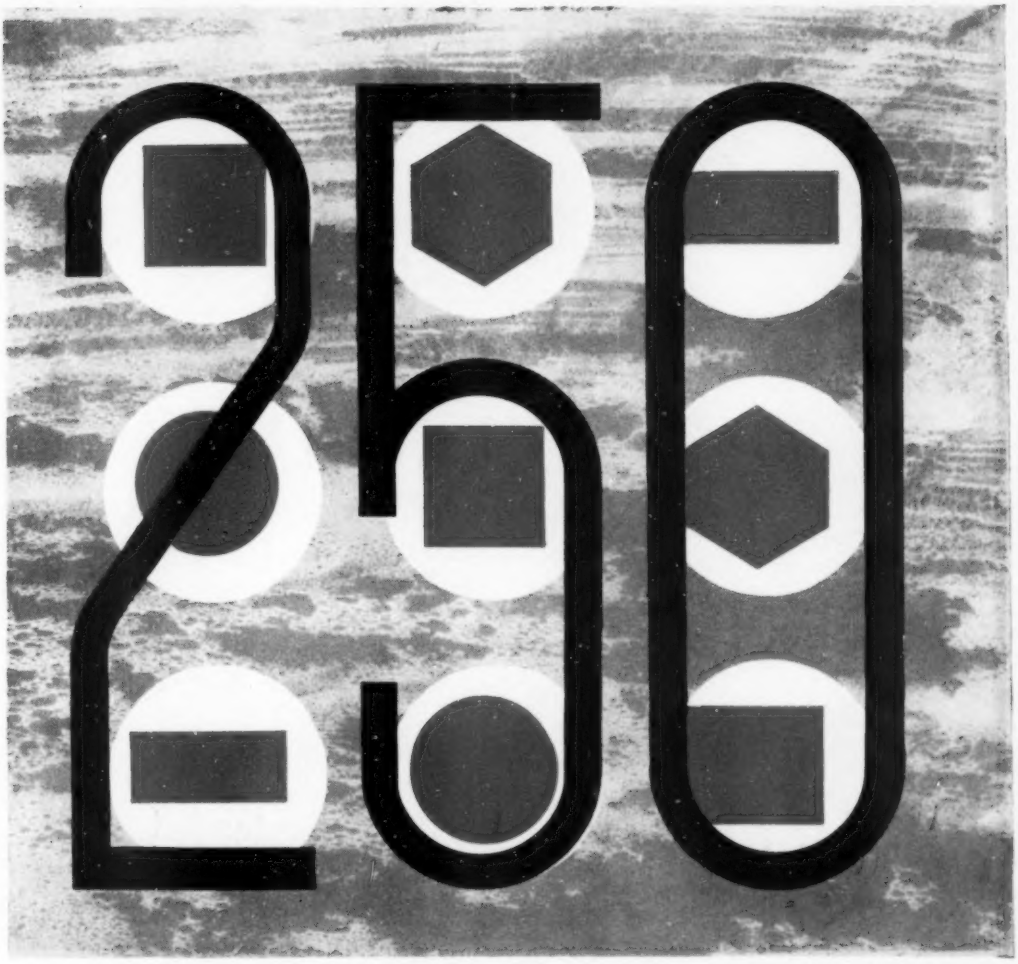

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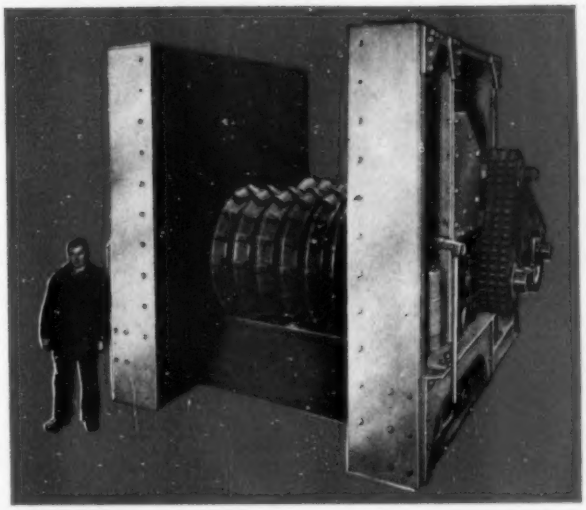

(*Right*) Size No. 10 Ross Patent Two-Roll Grizzly scalping limestone ahead of a 54" Gyratory Crusher. Note aperture adjusting lever on right hand side.

(*Below*) Size No. 6 Ross Patent Two-Roll Grizzly extracting –5" material from run-of-mine pit dirt.

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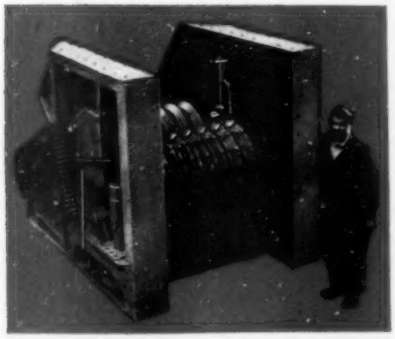

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Vol. 183
No. 4869

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NOVEMBER 10, 1961

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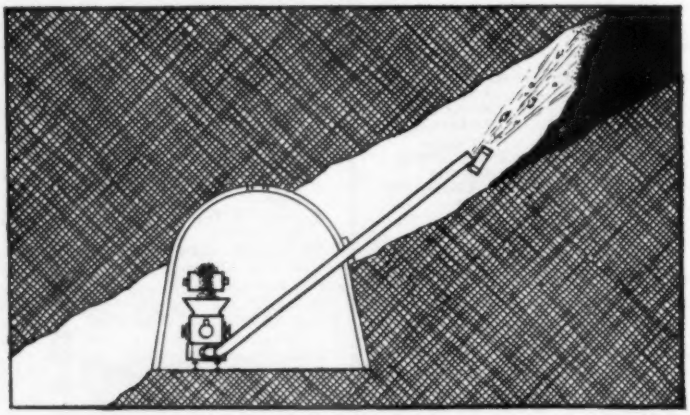

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IRON & COAL

Vol. 183 November 10, 1961 No. 4,869

Imported Methane

ALMOST three years has passed since an experimental cargo of liquid methane arrived in the Thames from the Gulf of Mexico in the specially converted tanker Methane Pioneer. Since then hardly a week has gone by without the matter being raised, either in the House of Commons or at gatherings of those connected with the coal or gas industries. The Minister of Power has now approved the Gas Council's plan to import methane—not from Central America, but from the Sahara.

The Gas Council's relief at getting its long-desired "go-ahead" can be readily understood, as can the careful thought which has gone into the Minister's decision. In these days of fierce competition in the fuel and power industries any Governmental procrastination is not endured too happily, but having withheld his decision so long, it is difficult to understand why the Minister could not have postponed it for another three months until the publication of the joint studies by the National Coal Board and the Gas Council on the feasibility of developing the Lurgi process.

On a number of economic grounds the Gas Council is justified in seeking supplementary supplies of its raw materials, and its arguments that the amount of coal which will be displaced by methane imports is comparatively small and that it is in the long-term interest of the coal industry that gas should be as competitive as possible cannot be lightly dismissed. There has been no mention of making full use of methane which is going to waste at a number of British collieries or of tapping further the resources in this field which this country could offer.

Already at five collieries in the West Midlands Division of the National Coal Board nearly 13,000,000 cu. ft. a week of methane is being drained and converted to practical use, and an estimate of a further 150,000,000 cu. ft. a week from pits already operating is not unreasonable. This represents about the tonnage shipped in liquid form in the first voyage of the Methane Pioneer.

The economic implications of making full use of home-produced methane do not need emphasis, nor can the strategical considerations—that the methane supply lines, with those of oil, depend on vulnerable sea-lanes. It is also pertinent to wonder how the Minister's decision lines up with the application by the Steel Company of Wales, Limited, to import cheap American coal for steel-making. If one nationalized industry is to be permitted to import raw materials in order, even indirectly, to help it compete with another source of power, the Central Electricity Generating Board would seem to have a good case for importing cheap coal wherever practicable.

The matter is obviously above the purely economic plane and the Minister of Power has, equally obviously, had to take far more into consideration than the pounds, shillings, and pence of importing methane. It is, therefore, a little strange that he did not await further information about the possibilities of the Lurgi system before giving the Gas Council *carte blanche*.

Investment in Coal

IT is held by a surprisingly large number of otherwise well-informed people that the present Government thoroughly dislikes the nationalized industries (particularly the Coal Board), and is doing all it can to encompass their overthrow. Admittedly Conservative backbenchers snarl a little when the "cost" of mining coal is aired in the House—but that is what backbenchers are for, and Socialist backbenchers have been known to do precisely the same when their party was in power.

The recently published White Paper,* giving a preview of the Government's plans for public investment in the next financial year, reveals no deep-laid plot for crippling the nationalized industries by fitting financial manacles. Normal and necessary development is to be continued, and such slowing down as economic brakes can provide is only that common to the nation and industry, public and private, alike. The approved total of investment of £1,840,000,000 is £200,000,000 higher than the estimated out-turn for 1960-61 and about £85,000,000 greater than the estimate for the current financial year. Perhaps the increase could have been greater had internal economic pressures been less severe, but at least the upward trend is continued and parity, of a sort, maintained with industry in the private sector.

By and large the pattern is in accordance with the Government's policy of bringing the rate of increase of total expenditure into a better relationship with the nation's prospective resources and, at the same time, strengthening our efficiency and competitive power. We are reminded of the new approach to investment and borrowing in the White Paper of April—The Financial and Economic

* Public Investment in Great Britain, October, 1961: Cmnd. 1522. Stationery Office, 2s. 3d.

Obligations of the Nationalized Industries. Proposals for fresh investment must be judged not only against the need for essential supplies and services, but also by their contribution to financial performance.

How the brake is being applied is seen in the figures of investment by the Coal Board. The out-turn in 1959-60 was £107,900,000; the estimated out-turn in the financial period 1960-61 is £94,000,000. At March, 1961, prices, the out-turn forecast for 1961-62 is £97,000,000 and approved expenditure for 1962-63 is £95,000,000. It is obvious that the Coal Board is not being given quite so much latitude in the investment field, but is still has a reasonable amount of *lebensraum*.

The White Paper recalls that demand for coal recovered from 194,000,000 tons in 1959 to 202,500,000 tons in 1960, when inland consumption and exports exceeded availability by nearly 8,000,000 tons. Stocks held by the board fell by 6,500,000 tons. So far this year consumption has run slightly below the level of 1960 and production has fallen by nearly 4,250,000 tons. A further reduction of over 6,750,000 tons has been made in the board's stockholdings so far this year, and a further substantial reduction is expected during the coming winter.

By the end of 1960 the board had spent £380,000,000 on capital account on major colliery schemes (schemes costing over £250,000). Of this, about £146,000,000 is accounted for by expenditure upon 160 major schemes substantially completed by the end of last year and £234,000,000 by expenditure so far incurred upon 128 uncompleted schemes. During 1960 work on 10 major colliery schemes and two large coal preparation plants was approved. The bulk of expenditure for 1962-63 will be upon schemes already in progress.

Sight is not lost of the smaller but highly important schemes (amounting in 1960 to some £27,000,000), which cover the programme for mechanization of coal production. The cost of equipping a coal face for full mechanization may be between £50,000 and £100,000, and the maintenance of output in spite of a serious drop in manpower, and the remarkable rise in productivity, indicate whether the investment in mechanization is proving worthwhile. By the end of this year the board expects to be getting nearly half of its saleable output by power-loaded means and towards this end up to 400 new machines are being installed.

The Coal Board, therefore, does not appear hamstrung by Governmental stringency; nor does the Government in this White Paper appear to be plotting the downfall of one of our oldest and most important basic industries.

ADA (HALIFAX), LIMITED—Mr. J. B. H. Jackson has been appointed an additional director.

Passing Thoughts . . .

SO long as the profit motive is the mainspring of our economy it is unreasonable to expect firms to export as an act of patriotism, although there seem to be a number of firms which are doing exactly this today. The fact that we still need more exports after 16 years of exhortation suggests that some more positive action is needed and the turnover tax with an automatic export rebate might well supply the extra dynamic to our industry.—Letter in The Times.

> *I believe there would be a smaller incidence of strikes and disputes in industry if directors or principals of large concerns made it a matter of habit to tour the workshops and offices at least once during each week. . . . So many employees with years of faithful service still rank as "works numbers," instead of works "wonders."—Letter in the Financial Times.*

Export margins, which are so vital to the country, are now becoming so tight that, if prices at home are to be subjected to similar pressures, we shall be forced either unpatriotically to do less export business, or, patriotically, and amidst the plaudits of the consumers and the economists, go bankrupt.—VISCOUNT CHANDOS, chairman of Associated Electrical Industries, Limited, speaking at the golden jubilee dinner of the British Electrical and Allied Manufacturers' Association.

> *How often is the foreman merely used to pass on unpalatable decisions? How often is he underpaid, not consulted, and not supported? If he is generally built up as a part of management, he will play a vital role in better relations and the general efficiency of a works.*—MR. D. L. NICHOLSON, *managing director, Production Engineering, Limited.*

Have the men who go out into industry straight after taking their first degrees—who after all comprise the main army of scientists and technologists—have they acquired, during their undergraduate training, a sufficient understanding—I will not say of research and of development—but even of design? Are they carrying a lighted flame—a torch with a battery—or just a reflector?—VISCOUNT HAILSHAM, Minister for Science, speaking at the Commemoration Day of the Imperial College of Science and Technology.

> *The days of the icy January bedroom, once regarded as part of the British way of life and a symbol of national manliness, are numbered.*—DR. CHARLES HILL, *Minister of Housing and Local Government.*

Coal fires have been a comfort to people since the Dark Ages, and I suppose it is a sort of comfort instinct which keeps them blazing away. But consider the work the housewife has to do to keep the place clean because of this, especially if she goes out to work, and they are just not worth the bother.—DR. PHILIP WEYMAN, Medical Officer of Health for Ilkeston (Derbyshire).

> *It is difficult . . . not to agree with Mr. Roy Mason, Socialist MP for Barnsley, who called the decision [against Saturday shift working] one of the silliest that the Yorkshire miners have ever taken. It is indeed shortsighted since, if the domestic market declines, it could well lead to unemployment.—Yorkshire Post.*

BECAUSE OF REDEVELOPMENT in Glasgow the works of the Horne Engineering Company, Limited, has moved to new premises in Johnstone (Renfrewshire).

October Steel

23 PER CENT. DROP ON LAST YEAR

PRODUCTION of steel in October dropped 4½ per cent. on the September weekly average and was 23 per cent. below the figure for October, 1960. The Iron and Steel Board, in its monthly statement published yesterday (Thursday), ascribes the decline in output from September to October to the labour dispute at the works of the Steel Company of Wales, Limited. The temporary loss in deliveries of finished steel products which resulted from the dispute is expected to be made good before the end of the year.

The October weekly average rate of steel output was 382,000 tons, compared with 400,200 tons in September, and the average for the first 10 months of the year of 431,600 tons. The weekly average of pig-iron production also fell from 260,700 tons in September to 248,300 tons in October (4.75 per cent.). The 1960 comparable figure was 313,900 tons, nearly 21 per cent. more than this year.

The drop in production is matched by an estimated 4½ per cent. fall (210,000 tons), in stocks of steel held by users and merchants in the third quarter of the year. This is a more rapid rate of stock reduction than occurred in the second quarter and is about equal in magnitude, the board states, to the rise which took place in the third quarter of 1960. The estimate is based on the returns so far received—covering about 35 per cent. of total stocks—in the census of use and stocks of steel taken at the end of September.

Latest pig-iron and steel output figures (in tons), with the corresponding 1960 returns, are shown in the following table:—

Period.	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
1961—August ..	264,900	13,774,000	338,400	17,595,000
September ..	260,700	13,554,000	400,200	20,811,000
October ..	248,300	12,914,000	382,200	19,872,000
1st 10 months	288,400	14,997,000	431,600	22,443,000
1960—August ..	291,400	15,152,000	422,900	21,988,000
September ..	305,800	15,900,000	481,000	25,012,000
October ..	313,900	16,321,000	497,000	25,842,000
1st 10 months	301,500	15,677,000	464,600	24,159,000

Redbrook Tinplate Works to Close Down

WORKS of the Redbrook Tinplate Company, Limited, at Redbrook, near Monmouth, is to be closed down next month. The 150 employees were given a month's notice on Monday. This expires on December 2, but it is hoped to keep the plant going on a day-to-day basis for a further 10 days. The works produces hot rolled steel sheet for hermetically sealing food and drug tins. Lack of demand has led to the decision to close down.

Redbrook works was opened in 1771 and some years later the company expanded and opened a works in Pontnewydd. This plant was closed by the company four years ago.

Axle Forge Trials at Durgapur Steelworks

COMMISSIONING trials began last week in the axle forge at Durgapur Steelworks, near Calcutta. This plant is part of the wheel and axle plant, the last section of the £120,000,000 steelworks being built at Durgapur by the Indian Steelworks Construction Company, Limited (ISCON), a consortium of 13 of Britain's leading engineering companies, for the Government of India. It is expected that wheel production will also start shortly.

The axle blooms are made from steel produced in the Durgapur melting shop and rolled in the primary mills. The blooms are cut into the desired length by cold saws and charged into a furnace where they are brought up to the correct forging temperature. A 7½-ton air-operated hammer forges them to the rough axle shape. Another furnace heat treats these forgings to give the required metallurgical properties.

Durgapur will be capable of producing 1,000,000 ingot tons of steel a year when completed.

International Factory Equipment Exhibition

EQUIPMENT and machinery produced by over 350 firms will be on view at the ninth International Factory Equipment Exhibition which will be opened at Earls Court, London, on Monday by Dr. Beeching, chairman of the British Transport Commission. This year, for the first time, the exhibition is grouped in 14 separate sections, each one corresponding to a major division of industry.

Concurrently with the exhibition, the British Productivity Council is organizing two conferences entitled "Efficiency in Today's Factory" (Monday to Wednesday) and "Producing for European Markets" (Thursday). Subjects in the main conference include "Organizing for Product Quality," "Fitting the Job to the Worker," "Low-cost Automation," and "The Effective Use of Capital."

CENSUS OF PRODUCTION to be taken in 1962 for the year 1961 will be a sample inquiry and the questions asked will relate only to sales and work done, capital expenditure, and stocks and work in progress, states the Board of Trade. Firms will also be required to give details of their sales direct to the public. Undertakings producing coal, gas, and electricity are exempt from the census.

16 Scottish Pits to Close Next Year

SIXTEEN pits in Scotland are to be closed down next year, it was announced after a meeting between the Scottish Divisional Coal Board and the executive committee of the Scottish Area of the National Union of Mineworkers in Edinburgh on Monday. The closures, which will affect some 5,000 miners, include Glenochil Colliery (Clackmannanshire) where production began only six years ago. The future of Rothes (Fife), another of the big new pits, was stated to be "in the balance."

After the meeting, Mr. Alex Moffat, president of the Scottish area of the NUM, said that the union would call for an inquiry into the management, planning, and financial transactions of the board. Mr. R. W. Parker, chairman of the Scottish Division of the NCB, said he hoped negotiations would continue, but he had power "to go ahead and carry out the closures." He denied suggestions by Mr. Moffat that the board had mismanaged the industry and that public money had been wasted.

The pits to be closed are Glenochil, Glencairn, Blantyreferme 1 and 2, Boglea, Knowehead, Woodmuir, Ardenrigg, Lochlea, Coalburn, Westoun, Arniston, Winton, Roslin, Polquhairn, Roger, and Hassockrigg. The future of Rothes, which cost about £8,250,000, and of Bowhill, Fife, where a big redevelopment was put through after nationalization, were both said by Mr. Parker to be doubtful.

Mr. Parker, in a review of 1961, said that the financial loss this year in Scotland, before charging interest, would be greater than in 1960. "The full demand for coal expected from certain industries has not materialized and on present trends may not materialize quickly, so 1962 is approached with uncertainty about the level of demand for coal. The indications are for a lower demand."

Discussing Glenochil, Mr. Parker said that the reserves of workable coal there were estimated at 37,000,000 tons, and an output of 3,000 tons a day for more than 40 years was planned for. In fact, output had seldom been above 800 tons a day. More than half the reserves lay in seven seams too thin to work. At its present level of output the colliery was a very heavy loser, and there was no prospect of improved results in the future. "There is no alternative but to close down Glenochil. Capital expenditure still to be written off amounts to £1,600,000." Work on the present Rothes horizon of coal would stop in March, 1962. The operating loss for 1961, including development, was estimated at over £1,000,000.

A call for the resignation of Lord Robens, chairman of the National Coal Board, and an appeal to the national executive of the NUM to fight the closure proposals by a national strike if necessary, were made by the 900 miners of Rothes Colliery on Tuesday. Mr. Stabler, NUM delegate at the colliery, said: "It appears that the miners at Rothes are expected to wait around like sitting ducks and have their heads shot off at the appropriate juncture."

Scottish Labour MPs have tabled a motion in the Commons asking the Government to appoint an independent inquiry into the social and economic consequences of the proposed closures. The motion, which is tabled by Mr. Thomas Fraser, former Under-Secretary of State for Scotland, calls on the Government to direct that the closures shall not take effect until the report of the committee of inquiry has been received and considered.

Success of Durham NCB's Safety Drive

CAMPAIGN for greater safety in the Durham Division of the NCB had been vigorously pursued in the past few years and was beginning to show results, said Dr. William Reid, chairman, last weekend. For the first 10 months of this year, the rate of fatal accidents in the division had been reduced to .068 per 100,000 manshifts. In the 10 months there had been only 12 fatal accidents, yet it was not so long ago that they averaged about 50 a year.

Addressing 500 colliery officials on safety in mining at a meeting at Blackhall, organized by No. 3 Area of the Durham Federation of Mining Officials' Technical Society, Dr. Reid said that much more had yet to be done to convince the many doubters that in fact accidents were caused and could be prevented. The days of the "pure accident" were gone. "We must try and get rid of the idea of fatalism in the industry."

Based on the 1958 statistics, there had been a saving of 55 lives in the division. "This makes working for greater safety worthwhile," Dr. Reid said. He added that the total cost of publicity in Durham, including all prizes, was less than one halfpenny per man per week.

Productivity Records Broken in West Midlands NCB

ALL four Areas in the West Midlands Division of the NCB, and the division as a whole, achieved productivity records in October. Output for all colliery workers in the division rose by nearly 1½ cwt. compared with October last year to 31.8 cwt. per manshift, and the figure for coal-face workers increased by over 3½ cwt. to 101 cwt. Coal-face records were achieved in North Staffordshire Area and Cannock Chase, and overall records in Cannock Chase, South Staffordshire, and Shropshire, and Warwickshire. All the previous best performances had been achieved in recent months.

Manpower also took an encouraging turn. The net loss in the division during October was only 28, compared with an average of more than 240 for the first nine months of the year. Although manpower was down by 2,438 compared with October last year, saleable output rose by 63,400 tons to 1,193,100, an increase of 5.6 per cent. In South Staffordshire and Shropshire, the increase was over 20 per cent. Saleable output in September and October was more than 140,000 tons above the figure for the corresponding months of 1960. This has reduced the shortfall in output compared with the first 43 weeks of 1960 to 137,000 tons.

NCB Pays More to Keep its Craftsmen

RATHER than lose its skilled craftsmen to other industries, the National Coal Board, for the second time in less than a year, has decided to increase the shift allowance from 3s. to 5s. for 18,000 mechanics and electricians with special responsibilities: which would amount to a rise of 10s. a week. In addition, all craftsmen who spend a minimum of one-and-a-half hours in the area of the coalface, will get a bonus of 2s. 6d. a shift, or 12s. 6d. a week.

As in practice many men with statutory responsibilities will qualify for both payments, the board hoped that this will persuade them to stay.

Gas from the Sahara

LORD ROBENS DEPLORES IMPORT DECISION

STRONG reaction from the coal industry met the Government announcement last Friday that it had approved the £18,000,000 scheme to supply one tenth of Britain's gas by importation of liquid methane from the Sahara. Lord Robens, chairman of the National Coal Board, said he was "grievously disappointed and considerably surprised" that this had been decided before it was known whether gas could be produced equally cheaply from British coal by the Lurgi process. The methane scheme will reduce expected demand for coal by the gas industry in 1965 by 800,000 tons. The gas industry at present uses 19,000,000 tons of coal a year.

Lord Robens said that the joint study of Lurgi by the coal and gas industries should be finished in two or three months, and he had every reason to believe it would be competitive. He therefore welcomed the statement by Mr. Richard Wood, Minister of Power, that his decision would not prevent the building of a Lurgi plant as advocated.

MR. RICHARD WOOD

Mr. Wood, in a statement in the Commons, said that in reaching the decision he had taken into account the urgent need of the gas industry to reduce costs of production, the technical advantages of methane, the comparatively small capital cost of the scheme and the benefit it might bring British shipbuilding interests.

Objections of NCB

Mr. Wood said he had also had regard to the effect on the balance of payments, security of supplies, and objections by the National Coal Board. His decision on the scheme "in no way" prejudged the building of a large Lurgi-process plant for the gasifying of coal on a large scale "if such a plant promises to be competitive." The methane scheme would develop a new technology and provide the country with an additional source of energy. "It is not without risks, but I am convinced they are outweighed by its merits," he said.

Mr. Wood agreed with the Select Committee on the Nationalized Industries on its view that the gas industry should be enabled to take advantage of cheap supplies in order to strengthen its competitive position. Replying to questions, he said he did not feel justified in waiting for the report of the study group on the Lurgi process, set up by the Coal Board and the Gas Council, before deciding to approve the methane project. He denied that he had been too hasty. The building of pipelines for the methane scheme would make Lurgi coal gasification more economic, he said.

Mr. Ray Gunter, Opposition spokesman, said the statement would bring at least a further degree of despondency to the coalmining industry, and asked what the Minister proposed to do to combat the decline in manpower in the coal industry and to restore confidence. Mr. Wood said he did not believe the scheme would affect the likely demand for coal more than to the marginal extent quoted in the report of the select committee.

Sir Richard Nugent (Con.) said the opinion of the gas industry was that if gas remained at its present price consumption would fall and coal consumption would fall too. Importing methane would reduce the

WHAT THE PAPERS SAID . . . . .

. . . Considering the many handicaps under which the Coal Board labours, it is understandable that there should be extreme sensitivity about any measures which might threaten the new process for converting home-mined coal to gas.—The Times.

. . . The coal industry ought not to go on crying for protection. It has to live in the world with oil, and its future depends on its own vigour in maintaining coal as a complementary and competitive fuel.—The Guardian.

. . . Oil, like natural gas, seems likely to provide only a marginal source of supply. If the [gas] industry can now make a break-through to the efficient gasification of coal by the Lurgi process to replace conventional methods of carbonization it should be home and dry.—Daily Telegraph.

. . . It may well be that so far from being rivals Lurgi and methane will prove to be complementary sources of gas, and that the use of methane will help to make Lurgi plants economic.—Financial Times.

. . . The simple fact that the capital cost of the Lurgi plant approved is only half that of the methane-importing project is one good reason at least, for awaiting the joint report.—The Journal, Newcastle-upon-Tyne.

. . . The Government must search for ways of meeting the country's insatiable demand for fuel and power. But it must take care that it does not push the coal industry so far, that both sides of the coal industry lose heart and give up the battle.—Sheffield Telegraph.

. . . If the gas industry can import natural gas to improve its competitive position, why should the steel industry not import American coal to improve its competitive position in Europe? Why not, indeed?—Glasgow Herald.

price in the relatively near future. On the long view it would benefit the coal industry. Mr. Wood said he agreed. "Anything which betters the gas industry will not be to the detriment of the coal industry. I am convinced the building of a Lurgi plant will not be prejudiced."

Sir Henry Jones, chairman of the Gas Council, said in a statement that the scheme would mean a reduction of about 800,000 tons of coal a year, out of 19,000,000 tons, and a saving of more than 400,000 tons of oil products a year. The contract for the Saharan scheme extended for 15 years, but the first gas would not begin to flow until 1964. The project would mean a useful saving in production cost, although he could not guarantee that the prices charged to the user would actually be lower. He discounted the idea that methane was being introduced to replace coal. "It is being brought in to provide cheaper gas and an overall expansion of the industry," he said.

The British gas industry's investment of £18,000,000 covers the cost of the ships, storage, and regasification equipment at Canvey, a new main to carry the gas from South-east to North-west England (serving at least seven of the board's twelve areas), and plant needed to reform the methane in the areas.

Mr. S. W. G. Ford, president, National Union of Mineworkers, said in a statement that it was extremely unfortunate that the Government should have taken this decision just at a time when the coal-mining industry was showing signs of a recovery from the setbacks of the last three or four years. It would have been far better had it awaited the results of the joint investigation into the Lurgi process in which the NCB and the Gas Council were at present engaged. By its decision, the Government had once again displayed a complete disregard for the future of the nationalized coal-mining industry.

Mr. Jack Tighe, president of the Nottinghamshire branch of the NUM, described the decision as "hitting the miners below the belt." The position had been badly mishandled, he maintained, adding: "It is a fantastic situation, and the time has arrived when there should be strenuous resistance by the unions."

Despite the decision on the methane scheme, American suppliers of other types of gas are still hoping to do business with the British gas industry. A number of Texas oil companies are reported to be offering liquefied petroleum gas at highly attractive prices, and the Esso Petroleum Company is said to be offering naphtha, either of which could be used instead of liquid methane to enrich coal gas produced by the Lurgi process.

Personal

Mr. MAURICE LONERGAN has retired from his position as chief draughtsman with the Cleveland Bridge & Engineering Company, Limited, Darlington. He joined the firm 50 years ago.

Secretary of T. W. Greenwell & Company, Limited, ship, engine, and boiler repairers, of Sunderland (Co. Durham), Mr. WILLIAM SHERET has just completed 60 years' service service with the firm.

Managing director of Thos. H. Howell, Limited, steel stockists, of Newport (Mon), Mr. I. M. HOWELL, has been elected chairman of the Wales and West of England branch of the National Association of Iron and Steel Stockholders.

Executive director of Foster Electrical Supplies, Limited, a company in the Metal Industries, Limited, group, Mr. L. D. GUNNELL is to retire at the end of the year after 40 years' service. He will continue his association with the company as consultant.

Scottish Pit Team Wins Civil Defence Award

TRIBUTE was paid to the success of Easton Colliery civil defence rescue team in winning the industrial civil defence competition, sponsored by the Home Office and open to all industrial concerns in Scotland, at a function at Allanton miners' welfare hall last week. Mr. William Welsh, Area general manager of Area No. 4 (Central East), Scottish Divisional Coal Board, in presenting the awards, praised the team on being the first National Coal Board team to win the competition.

Leader of the Easton Colliery team, Mr. Joseph Aitken, said in reply that its success was the outcome of team work and the quality of the training received. He is seen in the photograph, at right, receiving the awards from Mr. Welsh.

£8,000,000 Colliery to Close for Repairs

BECAUSE chemicals in the water-bearing strata are damaging the concrete shaft linings, the new Bevercotes Colliery, near Retford (Notts), which is one of the most modern in Europe, is to be closed for 18 months. The pit cost £8,000,000 and, it is hoped, will have an output of 1,250,000 tons of coal a year when in full production. Most of the 560 miners employed there will be transferred temporarily to other collieries in the East Midlands Division.

If the mine were not closed now, repairs would still be needed in a few years time when the pit would be in full production employing four times as many men. A cast-iron lining will be inserted over a 60-yd. length in the upper part of each shaft and a 240-yd. length at the shaft bottoms will be treated with chemicals.

Large Japanese Order for Australian Coal

ORDER worth £A10,000,000 for Australian coal has been placed by Japan. The coal will come from the Kianga open-cast field in Queensland, and the 2,400,000 tons to be supplied will be shipped over a five-year period starting from the end of next March.

The order will help to develop the large coal deposits at Kianga and will also result in the nearby port of Gladstone being modernized to handle the trade.

Firth-Vickers Expansion

New Plant Will Double Stainless Steel Output

SCHEME costing about £4,500,000 for modernizing and reorganizing its plate and wide sheet production is to be undertaken by Firth-Vickers Stainless Steels, Limited, Sheffield, a joint subsidiary of the English Steel Corporation, Limited, and Thomas Firth & John Brown, Limited. The project will take three to four years to complete, and will more than double the company's output of stainless steel, which at present accounts for 40 per cent. of total UK production.

First stage of the new scheme will be the replacement of obsolete mills by a new 80-in. wide hot reversing mill with fully mechanized ancillary equipment for the production of plates up to 6 ft. finished width and from $\frac{3}{16}$-in. to 1-in. thickness. The mill will also be capable of rolling sheets up to 6 ft. wide which will be further reduced in thickness by cold rolling. Plate production, including the mill, will form a new plant to be built at Shepcote Lane, Sheffield, where preparatory site work has begun.

The completion of this plant will be followed by the reorganization of facilities for cold rolling and final processing of wide sheets at the company's Staybrite works, extending its handling capacity from 48 in. to 72 in. wide.

Growth in Demand

The scheme is the latest of a series covering the modernization of the company's equipment for the production of stainless steel since the war. The first of these involved the construction of the wide strip plant now known as Shepcote Lane Rolling Mills, Limited, which was followed by a new 12-in. strip plant also at Shepcote Lane. Both these plants have been considerably extended since they were first laid down.

More recently the bar production plant at Staybrite works has been completely re-equipped with new rolling mills and a new heat treatment plant. Extensions have also taken place at the company's works in Birmingham where the static foundry capacity has been more than doubled. These developments have cost the company an average of £1,000,000 a year since 1948.

The new scheme, says the company, is a continuation of its policy of steady development of production for greater efficiency and a stronger position in export markets. Mr. J. T. W. Dewar, managing director of Firth-Vickers, explained that it was being undertaken particularly having in mind Britain's probable entry into the European Common Market. As well as catering for the growing demand for stainless steel, this expenditure was aimed to maintain the group's competitive position in terms of quality and finish.

A STAINED GLASS WINDOW showing various departments at the steelworks of Samuel Fox & Company, Limited, branch of the United Steel Companies, Limited, was dedicated at Stocksbridge parish church last week. It has been given in memory of Mr. Oliver Inman, director of developments at the Stocksbridge works, who died five years ago.

Padley & Venables Acquisition

MAKERS of pneumatic equipment for mining, quarrying, and other industries, Padley & Venables, Limited, Dronfield, near Sheffield, is to acquire the whole of the issued share capital of Production Tool Alloy Company, Limited, Bedford, for £350,000. This will be satisfied as to £175,000 in cash and the balance in 583,333 ordinary 2s. shares in P&V.

PTA, which has recently undergone intensive development, produces tungsten carbide powder for moulding into hard-metal and machine-cutting tools and tool tips and for some years Padley & Venables has obtained all its requirements of tungsten carbide from PTA.

The present PTA management will be retained and Mr. G. N. Vansittart (chairman) and Major I. M. Floor (managing director) have been invited to join the P&V board. At an extra-ordinary meeting of Padley & Venables on November 28 it will be proposed that the capital be increased to £500,000 by the creation of 1,500,000 ordinary shares of 2s. each, ranking *pari passu* with the existing 3,500,000 ordinary.

Conference on Engineering Materials and Design

EXPERTS from laboratories, colleges, industry, Government departments, and advisory bodies will speak at a conference on engineering materials and design to be held concurrently with the Engineering Materials and Design Exhibition at Earls Court, London, next week. Twenty-two separate lectures will be given on the results of recent research covering a varied range of materials.

Opening address will be given by Sir William G. Penney, deputy chairman, UK Atomic Energy Authority, and chairmen of the daily sessions will include Dr. H. G. Taylor, director of the Electrical Research Association Laboratory; Mr. C. H. Flursheim, a director of A.E.I. (Manchester), Limited; Mr. W. L. Mather, director of Mather & Platt, Limited; Sir Sydney Camm, director of Hawker Aircraft, Limited; and Mr. A. E. Crook, chief engineer (production), National Coal Board.

MR. JOE HARTLEY has retired after 51 years at Thorncliffe Old Drift and Barley Hall collieries, Ecclesfield (Yorks).

Appointments

New Colliery Managers in West Midlands

MANAGEMENT changes at two collieries are announced by the West Midlands Divisional Coal Board. Mr. G. MORRIS has been appointed manager of Holditch Colliery and Mr. G. HOPCRAFT manager of Parkhouse Colliery, both in the North Staffordshire Area. After 13 years' service at Llay Main Colliery, Wrexham, Mr. Morris was appointed undermanager at Granville Colliery, Shropshire, in 1946. In 1948 he became manager of Sandwell Park Colliery in the South Staffordshire and Shropshire Area. He has been manager of Parkhouse Colliery since 1959.

Following a period in lead and tin mining, Mr. Hopcraft had experience at pits in Lancashire, Yorkshire, North Wales, and North Staffordshire. After a period as a directed practical trainee, he was successively under manager and acting manager of Berry Hill Colliery in the North Staffordshire Area for a total of three years. Since May, 1961, he has been acting manager of Foxfield Colliery, in the same Area.

Mr. J. R. GRONSETH has been appointed manager of the hoist department, mining division, of the Nordberg Manufacturing Company, of Milwaukee, Wisconsin.

Mr. J. B. FOSBROOKE has been appointed crane sales manager (England and Wales) and Mr. B. A. MACKIE, Hydrocon crane salesman (Midland area) for the plant section of Brown & Tawse, Limited.

Mr. M. STEVENSON an Under-Secretary in the Treasury, has been appointed a Deputy Secretary in the Ministry of Power in succession to Mr. M. T. Flett, who has moved to a post in the Air Ministry.

Mr. R. JOHNSON has been appointed works manager (melting shops) and Mr. R. WOGIN works manager (rolling mills) at the Appleby-Frodingham Steel Company branch of United Steel Companies, Limited.

Mr. G. H. WOODS, formerly commercial manager of the small tools division of the Birmingham Small Arms Company, Limited, has been appointed commercial manager of Thomas Chatwin & Company, tool manufacturers, of Birmingham.

Mr. HERBERT STONE has been appointed works manager of the Chesterfield engineering firm of Markham & Company, Limited, where he started his career as an apprentice nearly 40 years ago. He has latterly been assistant works manager.

Mr. R. F. LOUTH has been appointed manager of Foxfield Colliery, in the No. 1 (North Staffordshire) Area of the West Midlands Division of the National Coal Board. He has been manager of Victoria Colliery, in the same Area, since 1957.

Four new appointments have been made at Chesterfield works of Markham & Company, Limited, mining, mechanical and structural engineers, etc. Mr. HERBERT STONE becomes works manager, Mr. FRANK CHERRY quality control engineer, Mr. J. BATEMAN has been promoted chief designer from chief draughtsman, and Mr. M. G. BENNETT becomes deputy chief designer.

Mr. DONALD CAMPBELL has been appointed to the newly-created post of general works manager of Mavor & Coulson, Limited, conveyor and coalcutter manufacturers, of Glasgow. The company's three Glasgow works and the one at East Kilbride will come under his supervision. Mr. Campbell was assistant director of mechanical engineering, GHQ, Middle East Forces, during the war.

Duke of Edinburgh's Advice to Students

FUTURE prosperity of our industry, commerce and the nation depended on the standard and organization of technical, technological, and scientific education, said the Duke of Edinburgh, on Thursday of last week, when he visited Rotherham (Yorks), to open the £600,000 extensions to the College of Technology. "If the goods we produce for export are not better designed or more reliable and better than those made in other countries, we shall not be able to sell them oversea, even if they sell quite well at home," the Duke added.

Later at the Department of Fuel Technology and Chemical Engineering of Sheffield University, where he was the guest at lunch of Mr. R. A. Butler, the Chancellor of the University, the Duke said, "University education is merely so much vocational training unless it puts some fire in your belly, unless it instils a spirit of experiment, a courage to try new ideas, and not the least the ability to inspire others with enthusiasm. If you want to lead the way in any worthwhile endeavour you've got to be prepared for lethargy and indifference, obstruction, and discouragement. The real achievement and satisfaction lies in overcoming them."

Management Changes at Furnace Construction

WITH his resignation from the managing directorship of the Furnace Construction Company, Limited, Wednesbury (Staffs), Mr. A. H. Preedy has severed his connection with the company. He will be succeeded by Dr. G. J. Shaw who, with Mr. C. Bone, has been appointed a director.

Other appointments are:—Mr. W. Harper, to be responsible for administration and finance; Mr. M. G. Wright, to be in charge of production and development; Mr. J. Griffiths, responsible for the electric furnace department; and Mr. G. D. Ellis, in charge of sales, supported by Mr. J. O. Chadderton.

Agreement on Miners' Concessionary Coal

SEVERAL thousand mineworkers living in smokeless zones are affected by an agreement reached on Thursday of last week between the National Coal Board, the National Union of Mineworkers, and the National Association of Overmen, Deputies, and Shotfirers. From January 1, 1962, the concessionary coal allowance for miners will be replaced by solid smokeless fuel in districts where smoke control is enforced. In cases where smokeless fuel is not available, cash payments will be made.

The first coalfields to be affected by the new arrangement are those in Yorkshire, Lancashire, the West Midlands, Northumberland, East Midlands, and Scotland.

Mr. C. J. EVANS has been appointed southern area sales manager of Efco Furnaces, Limited. At present sales manager of the furnace department of the General Electric Company, Limited, he will take up his new appointment on December 1.

Dr. Hill's Diagnosis

COKE FEATURES IN PRESCRIPTION

"I SUGGEST that the fundamental problem which smoke control sets the coal industry is how to combat and overcome the unfounded prejudice against coke which is still only too common." The new Minister of Housing and Local Government, Dr. Charles Hill—still better known as the Radio Doctor—guest speaker on Monday at the monthly luncheon in London of the Coal Industry Society, showed that he can be just as forthright and down-to-earth when speaking about coke as he could when dealing with matters colonic.

He made it quite clear that he did not expect—even in the most favourable circumstances—the supply of premium smokeless fuels to match up to the enormous expansion of smoke control in the next decade and he thought that, apart from questions of availability, it would be wrong to regard premium fuels as the final solution. They were relatively expensive and not every householder in a smoke control area would want to pay that much for solid fuel.

Coke was a satisfactory and economical fuel for the open fire in the home and tens or hundreds of thousands used it outside smoke control areas not because they had to, but because they liked it.

Prejudice Must be Overcome

Overcoming the prejudice against coke would have to be tackled and solved if the coal industry was not going to be handicapped in its efforts to retain for solid fuel a proper share of the changed domestic markets in smoke control areas.

The Minister emphasized the trend towards modernizing fuel-burning appliances both in industry and the home and said the coal industry had also to make adjustments. Stocking and distributing manufactured smokeless fuel might raise difficulties of various kinds, but at least the industry retained the customer. When a smoke control order was made there would be a great many who had no very fixed or firm views about the type of appliance or fuel that would best meet their requirements. Those were the people with whom the industry was most vitally concerned.

"May I be frank?" Dr. Hill asked. "I believe that some sections of the coal trade have to set their house in order here. There have been occasions when the coal trade has gone out of its way to give the impression in a prospective smoke control area that raw coal is best, that premium smokeless fuels are indeed good but are scarce and expensive, and that coke is an unsatisfactory alternative to coal. That is not likely to encourage householders to stick to solid fuel. Are they not much more likely . . . to think hard about abandoning the use of solid fuels?"

The industry should do everything it could to dispel out-of-date prejudices about coke as an open-fire fuel. It could not be questioned that fulfilment of smoke control programmes—and fulfilled they must be as quickly as possible—would affect traditional patterns in the coal industry. The Clean Air Act was a challenge not a threat to the industry.

THE WILLENHALL FIRM of Ductile Steels, Limited, has won its appeal against the local council's decision refusing it permission to use its 4-acre sports ground for industrial purposes.

Largest Prepackaging Plant for Coal

BIGGEST coal prepackaging plant in the country was visited by Mr. Derek Ezra, the National Coal Board's director-general of marketing, on Tuesday. The plant is operated by Maurice James (Packed Fuels), Limited, and is situated at Water Orton, near Coventry. Coal is drawn from West Midlands collieries.

Last year Maurice James sold 1,500,000 bags of coal, mostly 56-lb. units. New plant was recently opened at Warwick, and with extensions at Water Orton and at a third plant in Bristol the target for the current year is 3,000,000 bags. Prepackaging of coal is generally in 28-lb. paper sacks, using doubles. Maurice James is concentrating on packing cobbles in 56-lb. units.

Prepackaged fuel was a service that met a particular need today, Mr. Ezra said. Many households had both parents out at work and were not able to receive the usual type of coal delivery—but they could pick up their coal supplies on the way home. And many families without large storage space would be able to obtain paper bags at their nearby grocer or garage and hold stocks of coal in a convenient and clean form.

New Productivity Record by Durham Coalfield

RECORD level of productivity in the Durham Division of the NCB was achieved in the week ended October 28. For the first time, average overall productivity in the coalfield exceeded 24 cwt. The average was 24.07 cwt. per manshift, compared with the previous record of 23.52 cwt. in the 25th week of the year.

In the corresponding week of 1960, overall productivity was 22.80 cwt. per manshift. At the face, productivity reached 67.77 cwt. per manshift compared with 65.09 cwt. in the same week a year ago.

WITH THE RETIREMENT at the age of 80 of Mr. C. L. Stokoe, managing director of "Monitor" Patent Safety Devices, Limited, the Wallsend firm has been sold and is now combined with D.P. Controls, Limited, manufacturers of automatic control and instrument panels, Newcastle-upon-Tyne, and Newcastle Precision Engineers, Limited, manufacturers of tools and precision machinists, of Dunston (Co. Durham). The directors of the combine, which will operate from Wallsend, are:—Mr. G. V. Carr, Mrs. E. Carr, and Dr. J. R. Campbell.

In Parliament

New Export Incentives Being Examined

MEASURES to improve the provision of credit for exporters and accelerated depreciation allowances are being examined as a form of incentive for exporters, said MR. SELWYN LLOYD, Chancellor of the Exchequer, during an economic debate. Mr. Lloyd said it had been said that incentives should be given for exports by relieving exporters of direct taxation, but for Britain to do this would be to act contrary to our international obligations, and other countries would follow suit.

The President of the Board of Trade and he were examining whether there were opportunities for further action over the provision of credit and whether the arrangements for various types of credit needed for various periods met the requirements. On depreciation allowances, he indicated that the possibilities of accelerated allowances would be examined.

MR. HUGH GAITSKELL, leader of the Opposition, said that in spite of the expansion of the Export Credits Guarantees Department capital, there was still a great deal of complaint about the high interest rates to be paid by British exporters. It was an interesting suggestion that there should be a specially low rate of interest for them, though it would be better to bring down interest rates altogether. It was absurd, he said, that this country should continue to have one of the highest rates of interest in the world.

Speaking of the export field, the Chancellor had said that there had been some encouraging success in markets where competition was keenest. Exports to the US were now at a higher level than for the first half of the year, and in the three months ended August 31 there was a rise of 23 per cent. over the previous three months. Exports to Western Europe were more than £1,000,000 in September for the fourth month, compared with a monthly average of £85,000,000 in 1960.

CALL TO HALT PIT CLOSURES

QUESTIONS have been tabled by Mr. ROY MASON (Lab.), a Front Bench spokesman, calling on the MINISTER OF POWER, Mr. Richard Wood, to halt all colliery closures for the time being. The Opposition is seeking an explanation why more closures are taking place while there is an increased demand for fuel both in Britain and in Europe.

Mr. MASON is asking for a general list of all collieries destined to close in the next five years, and the reasons why, and will urge that special assistance should be made available to areas affected by closures.

PLEA TO CUT WORKS ACCIDENTS

OPENING a two-day safety exhibition in connection with National Fire Prevention Week at Stocksbridge, Sheffield, on Tuesday of last week, Mr. Herbert Morley, a director and general works manager of Samuel Fox & Company, Limited, branch of United Steel Companies, Limited, emphasized also the hazards of industrial accidents. He said that over the last few years the firm's accident record had been "nothing which any one of us can rightly be proud."

Some 60 foot and eye injuries would not have happened if the victims had been wearing safety equipment that the company was willing to provide and wanted its employees to wear.

Ore Chartering

NO appreciable volume of tonnage was reported fixed last week and, although the undertone appears to be reasonably steady it seems that there is less pressure in certain major loading areas and it also appears that charterers have covered many of their prompt requirements and may be looking for some easement for forward positions.

In the iron ore section, Bombay/Rotterdam has taken a prompt 9,500-tonner at 44s. f.i.o. and trimmed and from Marmagoa 10,000 tons has been fixed to Antwerp-Holland Range at 43s. on gross terms also prompt, and a 12,000-tonner to Trieste for November loading at 38s. 3d. f.i.o. and trimmed. There is still inquiry for Japan and 49s. 6d. has again been paid for 12,000 tons, November 3-28, to one safe port Hirohata-Muroran Range with 1,000/1,500 tons Vizagapatam to Baltimore reports 11,000 tons ferro-manganese at $8.50 f.o.b. Liner terms discharge for prompt shipment.

Phosphate chartering from Casablanca to the UK is quiet although there is some inquiry for East Coast discharge, whereas to the Continent 15,500 tons has been taken for Antwerp at 19s. 9d. on gross terms for November 15-25, and Saffi and Casablanca/Philadelphia and Hampton Roads paid $5.40 for 11,300 tons, November 10-20, on gross terms. The Mediterranean trades are quiet and little is quoted from North Africa to the Continent. There is a moderate miscellaneous demand from West Africa for continental discharge and Bauxite has been fixed from Takoradi to Newport for second half November at 42s. 6d. for about 10,000 tons.

Winget-Gloucester Wagon Merger Proposed

UNDER an amalgamation proposal announced by Winget, Limited, manufacturers of concrete machinery and contractors' plant, of Rochester (Kent), and the Gloucester Railway Carriage & Wagon Company, Limited, Winget will acquire the £1,098,137 ordinary capital of Gloucester Wagon and, if the merger is approved, the name is to be changed to Winget Gloucester, Limited.

The terms are two ordinary 5s. shares plus £4 19s. nominal of new convertible unsecured loan stock of Winget for every nine Gloucester 10s. units. It is intended to underwrite the loan stock, so that Gloucester stockholders could sell their allotment for cash if they wish. Gloucester Wagon's results announced recently showed a loss of £305,000 on the year.

Fall in Profits of Stewarts and Lloyds of South Africa

ALTHOUGH group sales were little changed in the year to June 30, 1961, the group net profit of Stewarts and Lloyds of South Africa, Limited, the company controlled by Stewarts and Lloyds, Limited, Glasgow, fell sharply to R1,042,780 (R1,515,824), after tax of R379,050 (R674,420) and the dividend is maintained at 20 per cent.

On the current year's outlook, the chairman, Mr. J. R. Menzies-Wilson, says the position so far is not encouraging.

Roof Support Problems in South-West Durham

Experience in Working Adjacent to the Butterknowle Fault

by D. H. FAWCETT*

Practical experience gained under difficult roof conditions while working steep measures close to the Butterknowle fault at Thrislington Colliery in south-west Durham are outlined in this paper. The author claims that problems concerning the support of roadways have been largely solved by the use of Toussaint-Heintzmann arches, but the support of faces in the Low Main Seam, often overlain by a shale roof, is still presenting difficulties. The paper was presented to the North of England Branch of the National Association of Colliery Managers on January 18, 1961.

HAVING considerable effects on the structure of the Coal Measures over a wide area in south-west Durham, the Butterknowle fault gives rise to special local difficulties in working adjacent to it. Recently, at Thrislington Colliery, in Area No. 4 (South-West Durham), one face has been worked with its mothergate skirting some 20 yd. to 30 yd. from this major fault and the support of this roadway has posed problems. In addition, the weak roof strata in the area close to the fault have proved difficult to support and special remedies have had to be attempted. A series of steps to overcome these natural difficulties have been taken and, while the final solution has not been found in all cases, it is hoped that the experiences gained may be of some interest and use to others.

In the past, workings have rarely been attempted within 100 yd. of the southern side of this fault due to the anticipated difficulties. The districts considered in this paper were, in fact, laid out on this assumption. However, after the workings had commenced, new evidence on the position of the fault came to light. A borehole put down to prove reserves put the fault 100 yd. nearer than expected at one end of the area, while at the other end of the area, a heading encountered the fault 50 yd. nearer than expected.

A geological appraisal based on the borehole evidence suggested that the swing of the fault continued for some distance and a heading is now being driven at a neighbouring colliery to confirm this. The unexpected nearness to the workings of this major fault meant that if they were to continue, special methods might have to be employed.

The Butterknowle Fault

The Butterknowle fault is one of the group of four major faults met in the Durham and Northumberland coalfield which are characterized by very low hades. The Butterknowle fault runs in an east to west direction, cutting through the takes of a number of collieries and attaining a throw of some 600 ft. to 700 ft. in the Thrislington take (Fig. 1). The fault plane hades at a gradient of about 45 deg. to the south and, while the structure on its northern side is relatively flat with generally

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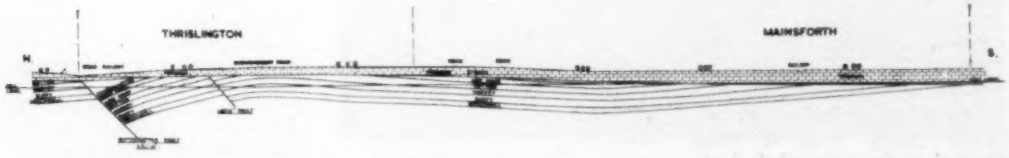

FIG. 1.—NORTH TO SOUTH SECTION THROUGH THE THRISLINGTON AND MAINSFORTH COLLIERY TAKES.

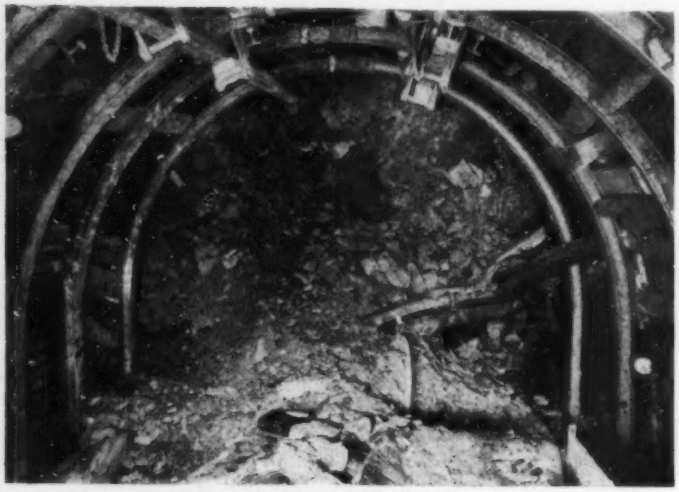

FIG. 4.—BACKRIPPING THE HUTTON 2ND EAST MOTHERGATE AFTER INITIAL ADVANCE OF 100 YD.

which has skirted some 20 yd. to 30 yd. from the Butterknowle fault. Other roadways, which are further from the fault, have, in general, given much less trouble, although two cases may be mentioned. In the Low Main Seam the first east mothergate was later used as the tailgate for the second east face. This roadway had originally been driven on 12-ft. by 8-ft. rigid two-piece arches, but suffered very severe crush behind the second face and 150 yd. had to be re-ripped. Thereafter, a second ripping was taken at the face and little difficulty was encountered.

The Hutton first east mothergate was also supported by rigid two-piece arches at 4-ft. centres, and these initially withstood the loading with little distortion. However, following the complete and sudden collapse of 8 yd. of this roadway some 10 yd. behind the face, it was necessary to employ heavier section rigid two-piece arches set at 3-ft. centres. No further trouble was encountered and the face advanced to a total distance of 950 yd. with only minor back ripping.

The Hutton second east mothergate presented a problem of a completely different magnitude. The first 40 yd. were driven in solid, after which the face was won out. This section of the road was supported by rigid two-piece arches of 4¼-in. by 4½-in. section set at 4-ft. centres and has never required any further attention.

When the face was started these arches were closed to 3-ft. centres, but from the start the face advanced slowly due to difficulties caused by water issuing from the floor of the face and streaming down to the mothergate. Many slips were present in the roof, particularly at the bottom of the face and falls of ground occurred at the brow edge. Conditions in the mothergate roadhead were very poor, due to the weak, damp roof, and heavy distortion of the arches was evident close behind the face. The initial distortion occurred at a distance varying from 10 yd. to 20 yd. behind the face and some arches were sheared at distances of 25 yd. from the face. Under these conditions the roadway deteriorated very badly and slurry from the face further reduced the area of the road by accumulating on the floor. After this road had advanced 100 yd. the face was stopped, due to considerations of quality and blend, though, had this not been the case, the face could have advanced very little further with this road.

While the face was standing the roadway was totally re-ripped using two-piece rigid arches set at 3-ft. centres. Much of this ground was "spiled," using pointed rails as conditions continued to deteriorate (Fig. 4).

In view of this experience it was decided to try Toussaint-Heintzmann arches and a specially

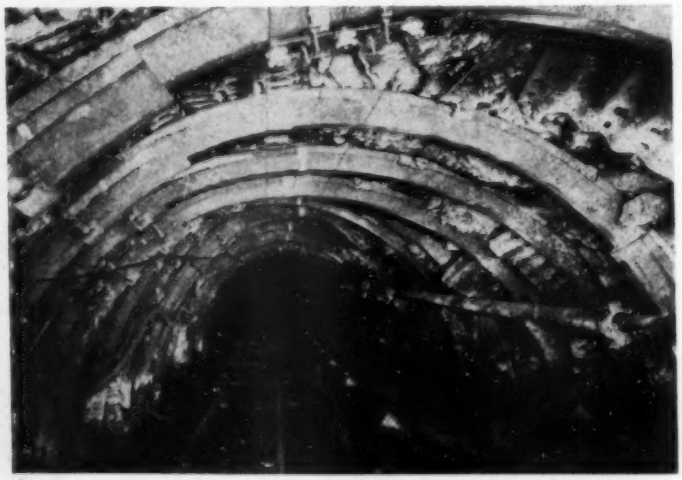

FIG. 5.—T.-H. ARCHES SET IN THE HUTTON 2ND EAST MOTHERGATE. PHOTOGRAPHED SIX MONTHS AFTER ARCHES SET.

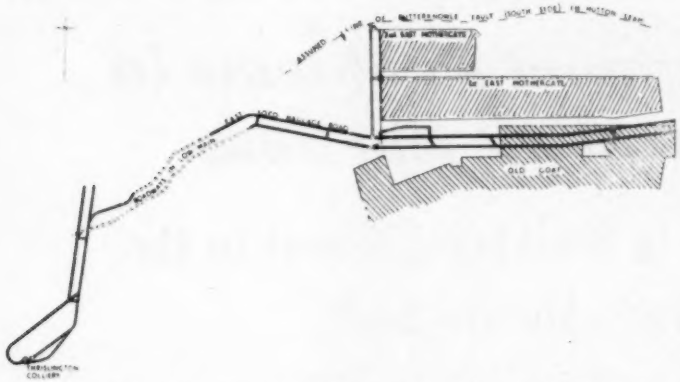
ASSUMED LINE OF BUTTERKNOWLE FAULT (SOUTH SIDE) IN HUTTON SEAM
THE EAST MOTHERGATE
2E EAST MOTHERGATE
EAST LOCO HAULAGE ROAD
OLD COAST
THRISLINGTON COLLIERY

FIG. 2.—LAYOUT OF WORKINGS IN THE EAST SIDE DISTRICT, HUTTON SEAM.

undisturbed seams, the effect on the southern side is considerable. Here the measures rise steeply from the fault plane to form an anticline and a further syncline whose axes are parallel to the fault. The gradient of the measures close to the fault on the southern side increases as the fault is approached and figures of 1 in 1½ have been recorded within 50 yd. of the fault plane. However, the gradients vary considerably and in this area rarely exceed 1 in 2.

Because the bending or folding of the strata becomes greater the nearer they are to the fault, increasingly strong stresses were imposed upon the measures. These have given rise to two sets of joint planes. The normal set of joint planes exists with nearly vertical sides and inclined in plan view at about 50 deg. to 60 deg. either side of the fault plane, their frequency increasing as the fault is approached. Imposed upon these, however, is a second set of joint planes whose intersection lies parallel to the fault in the horizontal plane and which are dipping at between 30 to 50 deg. to the south on the one hand and 30 to 50 deg. to the north on the other. The sides of all of these joint planes are highly polished in the shale beds and in the sandstone beds an infilling some ⅛ in. thick of soft gritty clay is often present.

When induced mining breaks are further imposed on this complex system an extremely difficult roof can result which then consists basically of an agglomeration of blocks with a very low coefficient of friction between each other and little cohesive strength due to the frequent joints. This is more marked in the softer shale beds which form the roof of the Hutton Seam than in the harder sandstone which sometimes forms the roof of the Low Main Seam. The shale which at other times forms the roof of the Low Main Seam, being some 6 in. to 5 ft. thick and lying between the coal and the sandstone has, in addition, very close bedding planes with polished sides which still further reduces its strength.

As would be expected, a number of minor faults parallel to the main fault are also present in this area and these further weaken the roof. They often have throws of 1 ft. to 6 ft. and appear and disappear at random.

Method of Working in the Faulted Area

Table 1 gives the principal details of the faces worked recently in the Low Main and Hutton Seams in a district closely adjacent to the Butterknowle fault. The faces are laid out to work in the strike direction with full dips of approximately 1 in 2 to 1 in 3 down the faces (Figs. 2 and 3).

The faces are worked coventionally with longwall undercutting machines and hand-loading onto bottom belts. The mothergates are normally kept some 5 yd. ahead of the face, as is the usual practice in inclined mining to allow a proper load to be established from the bottom belt onto the stage loader. The tailgates are ripped behind the face in line with normal practice. All roadways have solid rib sides.

The major problem that exists in this area is the support of the Hutton second east mothergate

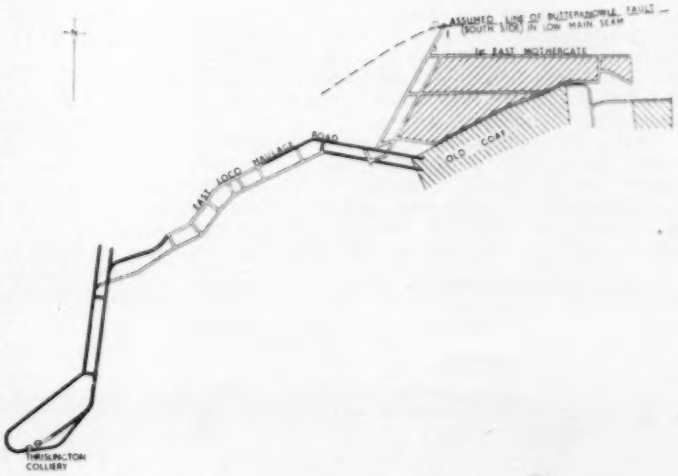
ASSUMED LINE OF BUTTERKNOWLE FAULT (SOUTH SIDE) IN LOW MAIN SEAM
2E EAST MOTHERGATE
EAST LOCO HAULAGE ROAD
OLD COAST
THRISLINGTON COLLIERY

FIG. 3.—LAYOUT OF WORKINGS IN THE EAST SIDE DISTRICT, LOW MAIN SEAM.

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FIG. 1.—NORTH TO SOUTH SECTION THROUGH THE THRISLINGTON AND MAINSFORTH COLLIERY TAKES.

T.-H. arches and some comparison with the rigid two-piece arches is possible. The initial 100 yd. of roadway which had already been totally re-ripped is showing distortion for the second time and a certain amount of back ripping has again been necessary where floor lift has seriously reduced the height and sheared the arches. In other places side pressure is causing the girder plates to bend thus necking the arch. Although this section of roadway is now between 200 yd. and 300 yd. behind the face, the movement does not appear to have stopped (Fig. 8).

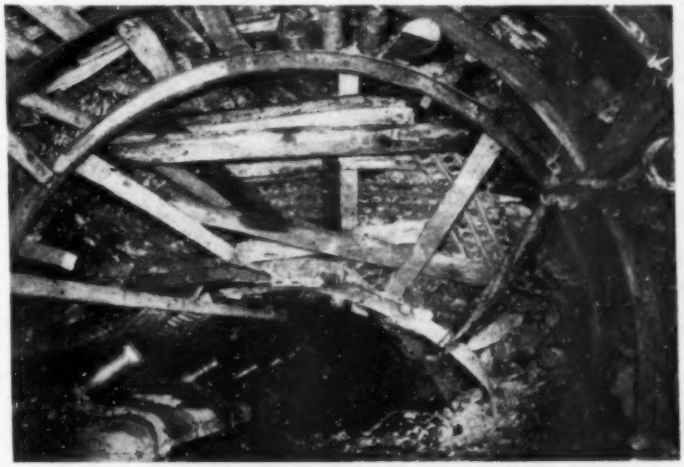

FIG. 8.—SECOND BACKRIPPING IN HUTTON 2ND EAST MOTHERGATE REPLACING ARCHES SET DURING FIRST BACK RIP OF THE FIRST 100 YD.

In contrast the conditions over most of the section supported by T.-H. arches are good and, although there has been a steady reduction in the area of the roadway, most of the arches are converging well, while the outbye arches are now appearing to yield much less often. However, in certain sections reverse loading has occurred and some arches have been badly distorted, especially in the extremely rough conditions at the inbye end. It is doubtful, however, whether rigid arches could have kept the latter part of this roadway open.

The graphs shown in Fig. 9 illustrate the yield of the clamps and also the reduction in cross-sectional area of the T.-H. arches and emphasize the variable loading experienced.

Thirteen T.-H. arches, *i.e.*, 7 per cent. only have so far been badly damaged, while in the initial 100 yd. of road, only about 50 per cent. of the rigid arches were re-usable. The initial costs are shown in Table 2.

Thus, on percentage recovery alone, the yielding arches have justiged themselves. In addition, however, they have saved at least one back ripping. In view of this their use is being continued in this roadway and consideration is being given to their adoption in another roadway to be started shortly close to the Butterknowle fault.

The noticeable features of the roadway from the point of roof control have been:—

(*a*) The apparently random variation in the extent and direction of the major loading.

(*b*) The random variation in the distance behind the face at which major loading became apparent, *i.e.*, 10 yd. to 30 yd.

(*c*) The great distance behind the face at which movement is still taking place.

The explanation of this would appear to lie with the joint systems caused by the Butterknowle fault and the induced mining breaks. These create a roof consisting of an agglomeration of blocks with little cohesive strength and a low coefficient of friction between each other. In these circumstances continuous movement appears likely, due to the lack of sufficient friction or cohesive strength to build up a successful Trompeter zone or bridging arch.

Face Support

The methods of face support adopted on these faces are given in Table 1. Two main problems have arisen and are dealt with separately.

Brow edge beside mothergate.—As is sometimes usual in inclined mining practice, the mothergate is normally kept some 2 to 6 yd. ahead of the face. Thus, the face creates a brow edge as it advances along the previously driven mothergate and this point of the face has given much difficulty. Falls have occurred on all the faces worked in this district and these have normally started at the brow edge and extended some 6 to 8 yd. up the face. While the height of these falls has depended on the type of strata, those occurring in the shale roof of the Hutton and parts of the Low Main Seam have extended some 10 to 12 ft. or more into the roof. This problem was first met in the Hutton first east face and the following measures were successively adopted to attempt to overcome the difficulty.

(1) The normal support system was initially in use with a 5-yd. mothergate pack and the normal 6-ft. wide track open at the bottom of the face. Immediately after a cut had been filled off, the face width was 10 ft. 6in.

(2) A 2-yd. solid coal pillar was then left at the bottom of the face, giving a track only 4 ft. wide for this 2 yd. When the cut coal had been cleaned off, this track was partially packed up before taking the solid coal off to form the 4-ft. track for the next cut. This had the effect of reducing the maximum width of the face at the

TABLE 1.—*Principal Details of the Faces Worked Recently in the Low Main and Hutton Seams, Adjacent to the Butterknowle Fault at Thrislington Colliery.*

	Hutton 1st East.	Hutton 2nd East.	Low Main 1st East.	Low Main 2nd East.
Average depth from surface (ft.)	585	685	495	565
Distance of mothergate from Butterknowle fault (yd.)	180	20—30	180	80
Seam thickness	2 ft. 10 in.	2 ft. 10 in.	2 ft. 6 in. to 3 ft.	3 ft. to 4 ft. 6 in.
Immediate roof	Soft shale	Soft shale	Sandstone or soft shale overlain by sandstone	Sandstone or soft shale overlain by sandstone
Floor	6-in. soft fireclay underlain by seggar	6-in. soft fireclay underlain by seggar	Seggar	Seggar
Length of face (yd.)	140	135	140 to 30	100
Average gradient on line of full dip	1 in 3.1	1 in 2.2	1 in 3.0	1 in 2.6
Water	Intermittently through roof in mothergate and at bottom of face	Intermittently through roof in mothergate and bottom 20 yd. of face. Through floor for bottom 50 to 100 yd. of face	Dry	Intermittently through roof in mothergate, also intermittently through roof on face at various points
Roadway support				
Mothergates	10-ft. by 8-ft. arches of 4-in. by 4-in. and 4½-in. by 4½-in. sections at 4-ft. and 3-ft. centres	10-ft. by 8-ft. arches of 4½-in. by 4½-in. section at 3-ft. centres. 12-ft. by 9-ft. T.-H. arches. 19.4 lb./ft. at 3-ft. centres	12-ft. by 8-ft. arches of 4-in. by 4-in. section at 4-ft. centres	12-ft. by 8-ft. arches of 4-in. by 4-in. section at 4-ft. centres
Tailgates	10-ft. by 8-ft. arches of 3½-in. by 3½-in. section at 4-ft. centres	10-ft. by 8-ft. arches of 3½-in. by 3½-in. section at 4-ft. centres	8-ft. by 7-ft. arches at 4-ft. centres	8-ft. by 7-ft. arches at 4-ft. centres
Face support				
Props	Dowtys at 3-ft. centres	Dowtys at 3-ft. centres	Wood at 4-ft. centres	Wood at 4-ft. centres
Bars	Steel straps	Steel straps	Wooden bars	Wooden bars and later steel straps
Chocks	Steel at 4-ft. intervals	Steel at 4-ft. intervals	Steel at 4-ft. intervals and wood at 4-ft. intervals	Steel at 4-ft. intervals and wood at 4-ft. intervals
Goaf system	4-yd. strip packs and 7-yd. wastes	4-yd. strip packs and 7-yd. wastes	Shale roof strip packed. Sandstone roof total caved	Shale roof solid packed from dummy gates. Sandstone roof total caved

brow edge from 10 ft. 6 in. to 6 ft. and prevented further falls in the Hutton first east face, which thereafter advanced regularly until finishing in a faulted zone.

(3) Shortly afterwards, however, a further Hutton face commenced production and, since this was closer to the Butterknowle fault, the jointing in the roof was more frequent and the gradient greater. Despite the use of the coal pillar, falls occurred again at the brow edge of the mothergate and further measures had to be adopted. Double packing was therefore first attempted and a 5-yd. pack was built immediately above a soft wood butt at the mothergate side. This was followed by a 3-yd. waste and a further 5-yd. pack obtained from the goaf. Little improvement resulted, however.

(4) It was then decided to attempt to reinforce the roof at this point before the face advanced beneath it. Dowels 6 ft. long and 1 in. dia. were therefore placed in holes drilled into the roof parallel to the seam, but about 1 ft. above it. These were put in position in the mothergate heading some 6 yd. ahead of the face and a big improvement resulted. This method was also tried later in the Low Main second east face with similar success and it is of interest to note that when, on one occasion, attempts were made to withdraw a dowel some 2 yd. behind this face with a hydraulic roof-bolt tightening machine, a pull of 5 tons was exerted before the dowel moved. A slight improvement was also made in that the dowels were clamped to the arches by simple hook-bolt clamps. This proved sufficient in the Low Main, but did not entirely cure the difficulty on the Hutton second east face, although the extent of the falls was by now considerably reduced.

TABLE 2.—*Comparison of Initial Cost Between T.-H. Arches and Rigid Arches.*

T.-H. arch.	£ s. d.	Rigid arch.	£ s. d.
12 ft. by 9 ft., 19.4 lb./ft.	14 13 0	10 ft. by 8 ft., section 4½ in. by 4½ in.	8 12 6
Four tie bars	2 1 0	Six Hammelock struts	1 12 6
Total	16 14 0	Total	10 5 0

(5) As a final step, the face was therefore swung until the mothergate was in advance, the face then being inclined back from the mothergate at 100 deg. A definite improvement once more resulted

and no further falls occurred. Shortly afterwards the double packing was dispensed with without deterioration and the final system in use was the combination of (i) the 2-yd. solid coal pillar, (ii) 6-ft. dowels 1 ft. above the seam clamped to arches 3 ft. apart, and (iii) face angle swung to 100 deg.

It has not since been necessary to employ the dowels continuously, although the coal pillar and face angle have been maintained as far as possible. Wherever particularly weak roof is met the dowels are reintroduced and this has to date proved completely successful in preventing further falls at this point on the faces.

Low Main Face Support

The problem on both faces worked in the Low Main Seam in this area is that of supporting a very variable thickness of soft shale which often occurs immediately above the seam and is overlain by a massive sandstone. This is not peculiar to Thrislington Colliery, but is found in other parts of Durham. However, the effect of the joint patterns associated with the Butterknowle fault, together with the close shiny bedding planes, makes a solution more difficult (Fig. 10).

Where, on occasions, the shale runs out and the sandstone forms the immediate roof of the seam, conditions are generally good, although forechocking is sometimes necessary to support the large blocks into which the roof has been divided by joints. However, where the shale forms the immediate roof, conditions are often extremely poor and many attempts have been made to overcome these on the second east face.

This face started with a shale roof over its entire length and difficulty was immediately encountered. After closing the bars to 2-ft. intervals and forechocking at 6-ft. intervals, the immediate roof, which was wet, could still not be held and, in instances, even fell within the top members of the wooden forechocks.

A number of different strip-packing systems were tried and, in the meantime, an up-borehole to waterlogged workings above, succeeded in draining these to a large extent. After rewinning the face a number of times the following system was adopted.

The face was solid packed using material won from 8-ft. wide bottom dummy gates, while roof bolts inclined over the coal were installed daily at 4-ft. intervals. The conditions improved greatly and the face operated for months without loosing a cut, during which time the shale diminished and was replaced by a sandstone roof which extended over most of the face.

However, the shale roof reappeared and within three weeks covered the whole face again, conditions deteriorated badly and, while the same support system was in use, the shale fractured around the roof-bolt plates and fell.

After attempting, without success, to catch this stone, of which 40 yd., 36 to 40 in. thick, was down at the top of the face, overcutting was tried. Hard coal is present at the top of the seam and a fixed height overcutter was provided to form a coal roof varying from 9 in. to 1 ft. 3 in. thick. Due to the gradient, cutting could only be performed in one direction and an adjustable bedplate was made for the machine to allow its height to be reduced while flitting down the face. A support system using 5-ft. steel straps at 3-ft. 6-in. intervals was employed and this allowed the ends of the straps to be kept not more than 3 ft. from the face. While a good coal roof was

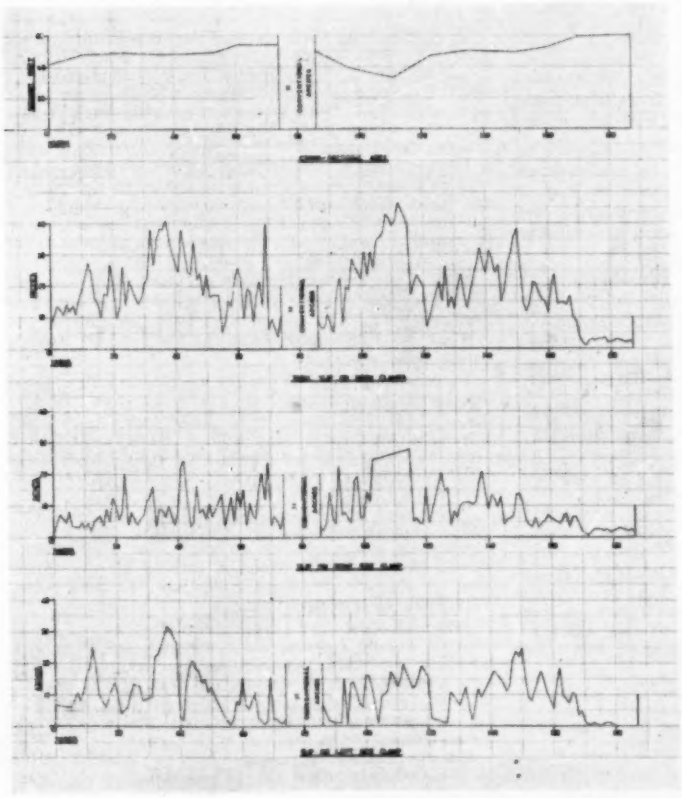

FIG. 9.—GRAPHS SHOWING THE REDUCTION IN AREA AND THE YIELD OF T.-H. ARCHES SET IN THE HUTTON 2ND EAST MOTHERGATE.

formed at the bottom of the face, no impression could be made on the shale at the top of the face. Even while cutting slowly and stopping every 9 in. to fill the cut with timber sprags, the roof over the top 40 yd. of the face could not be caught.

Shortly afterwards, the shale once more disappeared and the undercutter was put back into operation. At present, the shale is again reappearing and conditions are deteriorating, so that a fresh approach will once more be necessary.

FIG. 10.—LOW MAIN 2ND EAST MOTHERGATE DRIVEN IN ADVANCE OF THE FACE, SHOWING VARIABLE THICKNESS OF SOFT SHALE.

Conclusions

The variation in the roof conditions in this area due to the effects of the Butterknowle fault has made the solution of these problems difficult. Many factors are present which vary in magnitude so that each in turn may for parts of the area prove dominant. Constant re-appraisal is necessary and had it not been for a good level of supervision from the under-officials together with flexibility and good workmanship from the men, the results would have been very difficult to obtain.

Solutions have, however, been found to most of the problems. In particular, the T.-H. arches have been an improvement on the two-piece rigid steel arches previously used in the difficult conditions within 30 yd. of this major fault so that a usable roadway still exists. Dowels have also proved of great use in such conditions and the principle of reinforcing very weak roof strata before the arrival of the face may have applications in particular circumstances elsewhere.

The author wishes to thank Mr. G. H. Braithwaite, Area general manager, No. 4 Area, Durham Divisional Coal Board, for permission to give this paper and Mr. J. N. Brighton, "B" group manager, for his help and interest. The views expressed are those of the author and not necessarily those of the National Coal Board.

DISCUSSION

MR. W. S. FOSTER asked if the author could say something about floor lift, and if there was any evidence of such lift when T.-H. arches were set. In reply, the AUTHOR said that bottom lift had never been much of a problem and had only been experienced with rigid arches in other roadways.

MR. W. EVERETT asked if, with the use of T.-H. arches, there was any reason to believe they operated like the old-fashioned stilts and if the right tension was applied to the bolts.

The bolts were tightened with a box spanner, replied the AUTHOR. They were checked at intervals to see that they remained tight and there had been very few cases where they had been found to be slack. The loading on this roadway was eccentric and the design of the arch allowed this to be catered for, while stilts would give a more variable performance. MR. HARMAN (representative of T.-H. arches) added that, in considering the yielding structure, it was not on the same plane as a prop. The radius of the top member was different from the radius of the bottom member and when the clamps were tightened they controlled the yielding within certain limits only, *i.e.*, the construction of the clamps was such that even if they were tightened excessively, the yield factor would only vary by approximately 5 per cent. and the equivalent maximum force necessary to induce the yield would not exceed the deflection force of the arch members.

MR. J. V. GREENSMITH asked if the author had had any experience of how headings in solid coal withstood roof movement and also whether they had noticed any relation between convergence and the type of packing which was being used.

In general, replied the AUTHOR, solid headings stood very well. In particular, when one face was first won out in solid coal near to the Butterknowle fault, the roadway stood on rigid arches without attention. Different forms of packing were used in the initial stages of the roadway, all of which gave 2 to 3 ft. convergence in height.

MR. J. S. CARSON said the movement of the arches was very surprising and he would have expected the direction of major pressure to come from the left-hand side of the road. He asked if, instead of driving the road on the rib side of the coal, they had tried taking 4 or 5 yd. of coal and building a roadside pack, what would have been the effect on the roadway?

Replying, the AUTHOR said experience at Thrislington on these gradients was that the load came from the face towards the roadway rather than in the normal manner. They had never worked a deepside pack-hole because nearly all the faces were wet and it would be difficult to enter the deepside with a cutter.

MR. A. M. CLARKE said that he was pleased that the author had recognized the paramount importance of the attitude and frequency of jointing in problems of roof control. In considering the cross-section of the Hutton second east mothergate, he observed that the strata dipped at 1 in 2 and that one of the sets of joint

planes within the roof shales was nearly horizontal. In order to reduce the problem to its essentials, a unit cell of the joint pattern should be considered.

If a rectangle inclined at 1 in 2 towards the left, with one of the diagonals nearly horizontal, was superimposed upon the mothergate, the long sides then represented two of the polished bedding planes, the short sides two of the common polished joint planes (corresponding to the cleat when in the seam), and the diagonals represented one of each of the polished rotational shear joints which, as the author had observed, struck parellel to the bedding planes. Those planes which sloped downwards represented the three possible directions of movement within the mass of rock. If the coefficients of static and dynamic friction, respectively, were, in aggregate, equal on all three planes, then the amount of downward movement in each direction was proportional to the force acting upon it.

The resultant direction of movement under a vertical load was at a small angle to the left of vertical. In "normal" strata with unpolished joints, sudden movement occurred immediately after the elastic limit of the rock had been reached or the loading forces had exceeded restraining forces, the latter being equal to the coefficient of static friction, which, on unpolished surfaces, would differ considerably from that of the dynamic friction. The polishing of the joints reduced the coefficient static friction to a value close to that of the dynamic. This meant that any pair of planes responded by movement to an increasing load before any excessive force was applied, *i.e.*, the threshold force required for movement was low, and a slowly increasing load was almost continuously transmitted to subjacent planes.

"Key-stoning"

From time to time "key-stoning" or wedging of aggregates of blocks, moving at a small angle to the left of vertical would occur. Again consideration of a rectangular diagram showed that the high forces normal to the bedding and rotational shear planes, *i.e.*, those necessary to halt movement downwards and to the left, did, in fact, promote movement along the common joint planes, here dipping at about 1 in 1 to the direction of normal full load. This produced, relative to the upper left side of the mothergate, a negative or "reversed" load on the upper right.

With respect to Mr. J. Carson's observation that experience dictated that the full load was to be expected on the upper left side, and not on the right, this was only true when the high gradients were due to tilting during block faulting and not, as here, due to folding. The polishing of the bedding planes and the rotational shear jointing could be illustrated by the shearing of the pages produced when one side of a telephone directory was bent down and the other held firm. No such shearing took place when the directory was tilted bodily to one side. Thus, if both of the diagonals of the rectangle and the long sides were removed, then the only possible plane of movement was down and to the right, *i.e.*, along the common jointing perpendicular to the seam. Block faulting of this type was quite common in the Lancashire, Cumberland, and part of the north Northumberland coalfields, but, as demonstrated by the author's first cross-section, not along the south side of the Butterknowle fault. High seam dips were the common factor in joint conditions which were not otherwise comparable.

In view of the fact that the theoretical considerations he had outlined indicated a state of continuous but slow movement until the final wedging took place, instead of bridging of the more or less fixed span necessary to overcome high threshold forces, Mr. Clarke asked whether the zone on which full load occurred had moved towards the face during periods when the face had not been operating for some days?

The AUTHOR replied that there was no noticeable movement of the full load towards the face during the periods when the face was standing. The distance of this load from the face had always been very variable. The clamps on the arches were still tapped daily, close to the face, but in view of the length of roadway now supported on these arches, the outbye ones could only be tested at four-day intervals.

In reply to MR. W. S. FOSTER, who asked if there was any variation in the relative position of the seam to the floor of the roadway, the AUTHOR, said that the roadway was driven to suit the seam. It was preferable to set the feet of the low side of arches on stone and this could be arranged in the gradient of 1 in 2.

MR. W. DAVIDSON asked, with regard to roof control on the Low Main face, if packing on the face with dummy bottom caunch gates was being practised. The top was very soft, replied the AUTHOR, and they were trying to preserve it intact. The only way to get stone for packing was from bottom dummy gates.

Length of Boreholes

MR. R. WILLIAMS asked, regarding the boreholes, what length they were and did they go right through to the goaf above. Replying, the AUTHOR said the boreholes were 6 in. dia., were cored and were drilled through to two goafs above, one 229 ft. long at 58½ deg. to the Main Coal Seam and the other 243 ft. long at 45 deg. to the Fivequarter Seam. The Fivequarter borehole went into the seam and water was immediately tapped. The Main Coal borehole went into some obstruction and a small amount of water was obtained which subsequently blocked itself. The hole was redrilled twice and the seam penetrated.

In reply MR. R. WILLIAMS (Beamish), who asked in view of the extraordinary precautions taken if they were economically worth it, the AUTHOR said, after finding the solution to the problems in the Hutton Seam, conditions were such that the face operated daily for an advance of 500 yd. at approximately 5 ton/manshift; when clear of faulting the second east face also worked very well. They had not yet found the answer to the difficulties of support on the Low Main face.

MR. T. COOPER commented that in the conditions put before them, management problems must be very difficult. He asked if the author would give information on the size of the colliery and the number of men employed. Mr. Cooper also asked if the accident rate was above normal and what was the percentage absenteeism under bad conditions.

There were about 800 men employed at Thrislington Colliery, replied the AUTHOR. The output had been very variable, with the maximum of about 5,000 tons per week. The accident rate was very high, but serious accidents were rare. The average absenteeism for the year was about 10 per cent.

Replying to MR. E. K. WATSON, the AUTHOR said the floor of the seam was about 5 ft. above the floor of the roadway at the point where the belt left the face. It was very difficult to get a stable load from the face belt onto the gathering conveyor in these conditions unless the roadway was kept in advance of the face. If the belt engine was put on top of a bottom caunch a bottleneck would exist. No difficulty was normally experienced in keeping the roadways ahead of the face. Due to the gradients, it was impossible to put on more than 5 yd. of pack from the gateway and the rest of the stone was then filled onto the gathering conveyor. The conditions in the tailgates were, in general, good; these were normally protected by a 20-yd. coal rib left between them and the face above.

With regard to face lengths, they had little choice in the matter since the areas of coal had been bounded by goaf on the one side and the Butterknowle fault on the other.

MR. P. HALL noted that conveyors were all of the bottom-belt type and said that one would have thought that with gradients of between 1 in 2 and 1 in 3, difficulty would be experienced with coal rolling down the face. Generally speaking, chain conveyors were advisable on steep gradients and he asked if it would not have been advisable to adopt them under the conditions described.

In reply, the AUTHOR said shaker conveyors used to be the standard method at Thrislington, but while they were very reliable, difficulties were experienced in trying to control the coal properly on steep gradients. The carrying ability of bottom-belt conveyors had been proved for a gradient of 1 in 2. The greatest difficulty encountered in their use on these gradients was the great amount of tension necessary. Unfortunately, the weight of the belt must be carried in addition to the tension required to get a drive. Nylon belting was now in use for this reason.

MR. J. T. WALTON thought it wrong to compare T.-H. arches with rigid standard type arches. There was a considerable difference between standard arches and an efficient stilt. From the general movement of the face in that area, and the two seams mentioned, the Low Main and Hutton, he asked if working one seam had affected the working of the other. The evidence seen of reverse loading might be due to some extent to cavities on the right-hand side of the roadway not being effectively packed.

In reply, the AUTHOR said they had used wooden stilts, but they had not been very successful. In dealing with eccentric loading, the stilt was not of the same use as an arch designed to slide in the direction of the loading. The initial height of the roadway was 10 ft. and in places this was now reduced to 6 or 7 ft. In such circumstances, very long stilts would be necessary since it would be essential to use an arch which continued to yield slowly all the time. Reverse loading on the roadway was quite possibly due to inefficient packing. One or two arches had, in fact, been damaged due to bad lagging. However, in the difficult conditions experienced this was understandable. With regard to the sequence of working, the Low Main was working on top of and slightly to one side of the Hutton face which was following some 80 to 100 yd. behind. The faces were overlapping in plan view over about one-third of their width. This would obviously affect the Low Main rather than the Hutton mothergate.

Replying to MR. R. WILLIAMS, who asked if any consideration was given to the use of knuckle type jointed arches, the AUTHOR said the matter was not considered. It was thought that there might be a tendency for these to pull apart and distort.

MR. R. RAMSEY said in regard to the support of the weak shale overlying the Low Main Seam, mention was made of placing the dowels from the side of the roadway. He asked if they had considered placing the dowels on the face itself.

The AUTHOR replied that they had placed dowels with a flattened end (locally called a cricket bat) into the coal but these were not sufficient in the conditions on the Low Main face. They had also tried heading into the solid ground a yard at a time and roof bolting. None of these methods had enabled the ramble to be supported once it was down and they had found the only way of supporting it was to re-win the face.

MR. A. M. CLARKE said if the rectangle or unit cell was constructed so that one diagonal was exactly horizontal, at a dip of 1 in 2 (or 27 deg.) the theoretical direction of resultant movement had since been calculated to be at 16 deg. to the vertical, *i.e.*, the load direction specified for the Toussaint-Heintzmann arches. He asked if the author had made this or some similar calculation before specifying the 16 deg.

The design of the isometric Toussaint-Heintzmann arches, replied the AUTHOR, was arrived at purely by observation of damaged rigid arches in the roadway. It was extremely interesting that the calculation should tie so closely with these observations. The loading along the roadway had proved variable, although the design adopted appeared to be correct for the majority of conditions.

Manufacture of SMRE Roadhead Bar

MANUFACTURE of the roadhead bar designed by the Safety in Mines Research Establishment and which has been undergoing tests during the last two years has been undertaken by a new company, Prolloy Mining Developments, Limited, Pear Tree Lane, Dudley (Worcs), recently formed from Lloyds (Burton), Limited, and Joseph Wright & Company (Fabrications), Limited. In addition, the new company is manufacturing the Prolloy link bar, developed from the Prochar bar of Belgian origin, the low-alloy cast-steel Prolloy slide bar head, and the Wright roller bracket.

The optimum properties of the SMRE bars are obtained by welding and fully heat treating them under close control in modern furnaces. Due to the high standards required, quality control is exercised at each stage of manufacture so the specification is strictly followed.

The Prol'oy link bar, for use on prop-free-front faces, is made from high-strength alloy steel with a low weight per unit length. Underground tests have shown that over a 27-in. span the bar will accept 30 tons before showing signs of deformation. All joint members are now replaceable underground and the smallest member is designed to wear first.

The Prolloy slide bar head is manufactured in three sizes, 3½, 4, and 5 in. The head and wedge are made from fully heat-treated low-alloy steel castings of the same steel as the Prolloy link bar. The heads, fitting any hydraulic prop, have been fully tested by the NCB and will withstand 10-deg. offset loads without permanent deformation. They are provided with gravity toggles to anchor them to the bar and rollers to facilitate the advancement of the bar.

NINE JAPANESE steel firms have contracted to buy 13,400,000 tons of iron ore from Malaya in three years, beginning in 1962.

Simple Method of

CALCULATING THE CHANGE IN FURNACE PERFORMANCE WHEN FUEL OR STEAM INJECTION IS PRACTISED

by R. WILD, Ph.D.

(*British Iron and Steel Research Association*)

The injection into the blast furnace at tuyere level of fuel, steam, and oxygen has virtually passed the experimental stage, and many blast-furnace operators are now planning to take advantage of the reduced coke rate and higher productivity achieved by these injection techniques. This article by Dr. R. Wild, senior investigator of the BISRA blast-furnace laboratory, Imperial College, London, describes the theory underlying the influence of fuel or steam injection on blast-furnace operation and gives a simple method of calculating the reduction in coke rate and increase in productivity that will result from the use of these techniques.

INTRODUCTION

CONSIDERED in detail, the production of iron in the blast furnace is a very complicated process. The number of chemical reactions which may occur is large and the extent to which any one of them takes place is controlled by such factors as gas-solid heat transfer and chemical reaction rate. For this reason the detailed calculation of the effect of a major change in furnace operation—such as the substitution of an injected fuel for part of the coke—would inevitably be complicated even if all the basic information were available.

If the changes in energy requirement, in energy source and in efficiency of heat generation are taken into account, it is possible to consider the process solely from an energy standpoint.

Energy Balance of the Blast Furnace

Energy is required in the blast furnace for a number of purposes which can be summarized as follows:—

(1) To dissociate iron oxide. Whatever the mechanism involved the basic reaction—assuming the oxide is all present as hematite—is

$$Fe_2O_3 = 2\,Fe + 1\tfrac{1}{2}\,O_2 - 197\ \text{Kcals.}$$

(2) To heat the metal and slag to the tapping temperature.

(3) To reduce SiO_2, P_2O_5, etc.

(4) To decompose carbonates, etc.

(5) To make good the energy carried out by the top gases.

(6) To decompose that portion of the moisture in the blast which leaves the furnace as hydrogen.

(7) To meet furnace heat losses.

This energy is normally supplied by (1) the reaction of coke carbon with oxygen (either from the ore or from the blast) to give CO and CO_2 in the ratio found in the top gas, and (2) the sensible heat in the blast.

When fuel injection is practised, an additional source of heat is introduced, namely, the partial oxidation of the injected fuel to $CO + CO_2$ and $H_2 + H_2O$. At the same time, it is likely that the sensible heat in the blast will be changed and the quantity of moisture in the blast may be appreciably altered. Together with these premeditated changes, it is possible that the furnace efficiency will change, *i.e.*, the top gas CO/CO_2 ratio will alter and also the extent to which the hydrogen generated in the hearth is utilized. If the effect of injection is to be predicted all these changes must be considered.

Concept of Net Available Energy

Total energy produced per ton of iron from the coke carbon will be the product of two factors: the number of units of available carbon and the heat released per unit. The former can be obtained from the weight of carbon charged as coke corrected for carbon lost to pig, to flue dust, and by reaction with the CO_2 evolved from the limestone to reduce this is the top gas CO/CO_2 ratio. The second factor

is determined by the efficiency of carbon oxidation and is dependent upon the top gas ratio.

The energy introduced as blast heat is readily calculable from the blast temperature and the blast volume per ton of iron.

In normal blast-furnace practice the sum of these two constitutes the total energy input. The heat lost from the system as top gas sensible heat can be easily calculated, to a reasonable degree of accuracy, as top gas volume per ton Fe is, approximately, directly related to the blast volume.

The moisture introduced with the blast will be completely decomposed in the tuyere zone, but part of the energy needed for this will be given back to the system as part of the hydrogen will be utilized higher up the furnace. The net energy requirement for moisture decomposition can be calculated provided both moisture input and degree of hydrogen utilization are known.

If these two energy losses, *i.e.*, as top gas sensible heat and for moisture decomposition, are subtracted from the total energy input, a quantity of energy remains which must be sufficient to provide for the following needs:—Dissociation of the iron oxide; decomposition of carbonates, etc.; reduction of metalloids; heating the metal and slag to tapping temperature; making good furnace losses.

Provided the composition of the burden remains unchanged and the quality of iron made is not altered, these five energy requirements will be substantially independent of the manner in which the energy is supplied. This quantity of energy—which will vary from practice to practice—has been called the net available energy. Its calculation is considered in detail later in the report.

Changes in Furnace Efficiency Caused by Injection

In the blast furnace all the carbon reacting with oxygen from the blast, and with the iron oxide oxygen at a high temperature, will produce carbon monoxide. The degree to which this is subsequently converted to carbon dioxide depends on the extent of its reaction with ore oxygen at a lower temperature. In turn, this is dependent on such factors as furnace temperature gradient, gas-solid contact, burden reducibility, and degree of oxidation of the burden. The critical fact, however, from an

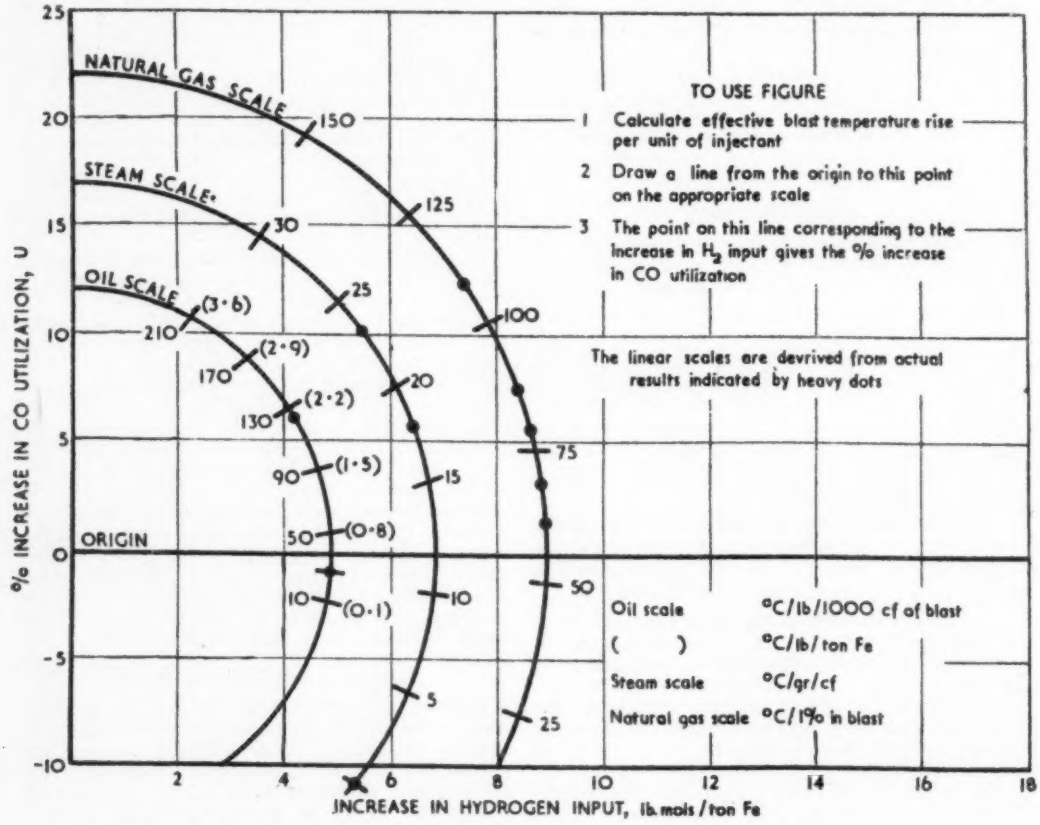

FIG. 1.—RELATION BETWEEN HYDROGEN INPUT TEMPERATURE COMPENSATION AND PERCENTAGE CHANGE IN CO UTILIZATION.

energy standpoint is the overall efficiency with which the carbon is used, which is determined by the CO/CO_2 ratio of the top gas. In any established practice this top gas ratio has reached a standard value. The important question is: How will injection affect the efficiency of carbon utilization?

In order to see if any general rules governing efficiency could be formulated, the available information on injection practice has been examined. A critical assessment of the data suggested that the following two factors have a major influence:—The increase in the hydrogen content of the ascending gases; the extent to which the flame temperature is modified.

Based on this assessment of the available data, giving maximum weight to trials carried out under controlled conditions with the object of studying the effect of fuel injection, Fig. 1 has been constructed. In this the change in the percentage carbon monoxide utilization is plotted against the increase in lb. mols of hydrogen leaving the tuyere zone per ton of iron. The percentage carbon monoxide utilization is given by the expression

$$100 \times CO_2/CO + CO_2$$

The extent to which effective blast temperature has been increased is shown on the arcs in deg. C. per unit quantity of fuel—either oil or natural gas—injected. Reduction of the moisture content of the blast will have an effect similar to raising the blast temperature. The exact numerical significance is not easy to establish, but a figure of 20 deg. C. as the equivalent to a lowering of the moisture by 1 gr./cu. ft. is suggested as a first approximation. Since the thermal effect of blast temperature increase is related to blast volume, it is logical to link the quantity of fuel injected to blast volume. For convenience, however, the more approximate figures for oil rate per ton of iron are shown (bracketed) as well. Insufficient data is available to enable scales for other fuels, *e.g.*, coke-oven gas and coal, to be included. Although steam is not a fuel, it does increase the hydrogen content of the bosh gases and so will have an effect on carbon monoxide utilization, and thus a steam scale is included.

It is not easy to obtain even approximate values of hydrogen utilization from normal blast-furnace data, particularly when the burden used contains combined moisture. Even if it were possible to obtain an accurate measure of the water content of the top gases this would not help, as much of this water would be derived from the moisture evaporated in the upper part of the stack. The best data available is almost certainly that collected from experimental furnace operation, *e.g.*, Liège and Bruceton, where particular attention has been paid to top gas analysis and where all facets of furnace operation are closely controlled.

Using this data the degree of hydrogen utilization has been calculated for a wide range of different burdens and furnace efficiencies. Carbon monoxide utilization and hydrogen utilization depend on the same basic factors—gas—solid contact, ore reducibility, etc., and thus it seems reasonable that hydrogen utilization may be linked with furnace efficiency as conveniently defined by CO/CO_2 ratio. For this reason these two were compared, in Fig. 2, and it is clear that there is a definite correlation. It is not considered that this relationship is related to equilibrium considerations as gaseous reactions in the blast-furnace stack are determined by kinetic factors. Attempts to fit data from normal furnace operation to this curve have met with only limited success. Considering the possible errors involved in the calculation, due particularly to unreliable top gas hydrogen analysis, this is perhaps, not surprising. It is therefore believed that the basic relationship shown in Fig. 2 is sound.

Since furnace operation can be influenced by a large number of factors, any attempt to predict the

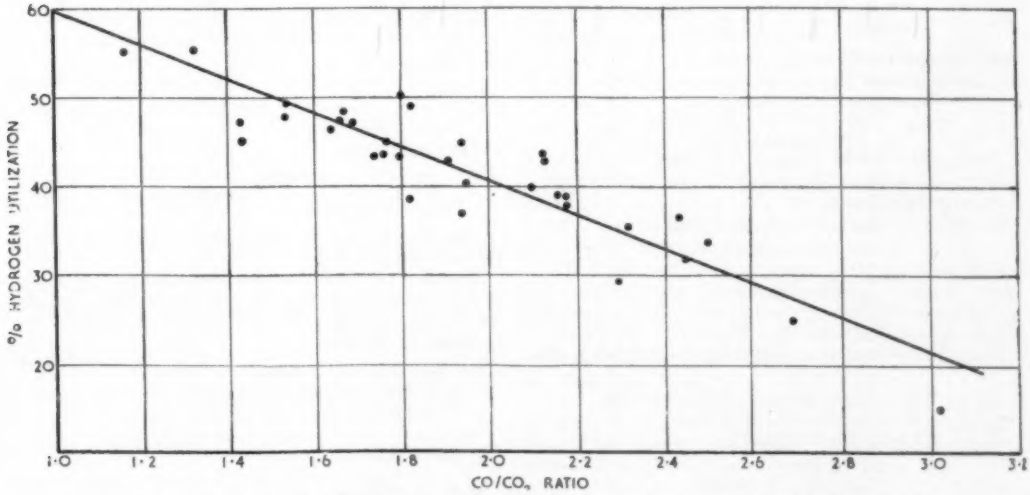

FIG. 2.—RELATION BETWEEN TOP GAS CO/CO_2 AND PERCENTAGE HYDROGEN UTILIZATION.

changes caused by injection which is based on only a few simple relationships must be regarded as approximate. However, the application of the diagrams, in the manner to be described, to actual injection operations has enabled the coke rates for operation with injection to be calculated and checked with the actual coke rates found. In most cases the agreement has been very encouraging, being within a few per cent.

From an established base practice the net available energy can be calculated. Presuming that no burden changes are made and that furnace heat losses remain substantially constant, the same net available energy must be supplied under injection conditions. Provided that any changes in blast temperature and blast moisture which will accompany injection are known, the new CO/CO_2 ratio and percentage hydrogen utilization can be found. Calculation of the energy introduced as sensible heat in blast, energy from injected fuel, energy lost as top gas sensible heat, and that used in decomposition of blast moisture enables the energy to be supplied by oxidation of coke carbon to be found. From this, knowing the top gas CO/CO_2 ratio, the furnace coke rate under injection conditions can be readily calculated.

The method of carrying out these calculations is shown in detail in the next section.

Method of Calculating the Effect of Injection

1.—*Calculation of Net Available Energy for Base Practice*

First the heat from carbon available for heating and reduction is obtained as follows:—

(*a*) Calculate the number of lb. atoms carbon per ton iron charged as coke.

CR = cwt. coke/ton
C_1 = per cent. carbon in coke

$$\therefore \frac{CR\ 112}{12} \frac{C_1}{100} \text{ lb. atoms carbon}$$

$$= 0{\cdot}0933\ CR\ C_1 \text{ lb. atoms} \quad \ldots\ldots \quad (1)$$

(*b*) Corrected for carbon losses

(i) to iron

C_2 = per cent. C in pig

$$\therefore \frac{2240}{12} \times \frac{C_2}{100} \text{ lb. atoms C}$$

$$= 1{\cdot}867\ C_2 \text{ lb. atoms} \quad \ldots\ldots\ldots \quad (2)$$

(ii) to flue dust

C_3 = per cent. C in flue dust
F = flue dust make lb./ton

$$\therefore \frac{FC_3}{12 \times 100} \text{ lb. atoms}$$

$$= 8{\cdot}33 \times 10^{-4}\ FC_3 \text{ lb. atoms} \quad \ldots\ldots \quad (3)$$

(iii) by reaction with CO_2 from $CaCO_3$ decomposition.

If S = stone charged, cwt./ton iron
R = top gas CO/CO_2 ratio
Carbon lost to reaction

$$= \frac{1{\cdot}12\ SR}{(2 + R)} \text{ lb. atoms}$$

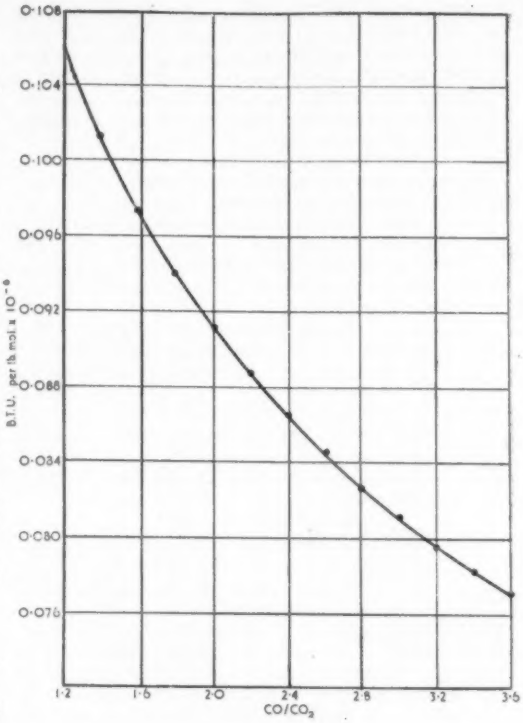

FIG. 3.—HEAT GENERATED FROM 1 LB. MOL CARBON BURNING TO VARIOUS CO/CO_2 RATIOS.

Suitable allowance must be made from any CO_2 produced by decomposition of carbonate contained in the ores.

(*c*) Carbon available for heating and reduction

C_4 = per cent. carbon available per ton iron.

$$C_4 = 0{\cdot}0933\ CR.C_1 - (1{\cdot}867\ C_2 + 8{\cdot}33 \times 10^{-4}\ FC_3 + \frac{1{\cdot}12\ SR}{2 + R}) \quad (4)$$

$$\text{Heat available} = C_4 \times \left(\frac{0{\cdot}172 + 0{\cdot}0505R}{1 + R}\right) \text{ million B.t.u.} \quad (5)$$

The fraction in the bracket can be read from Fig. 3 for any value of R.

The next step is to calculate the other factors of the process, that is, the sensible heat in the blast and the waste gas and the heat required to decompose the moisture in the blast.

(*a*) Sensible heat in blast

B = blast volume, cu. ft./min.
P = Production rate, ton/day.

$$\therefore \text{Blast volume/ton iron} = \frac{1{,}440\ B}{P} = B_1$$

If T_1 = blast temperature, deg. C.

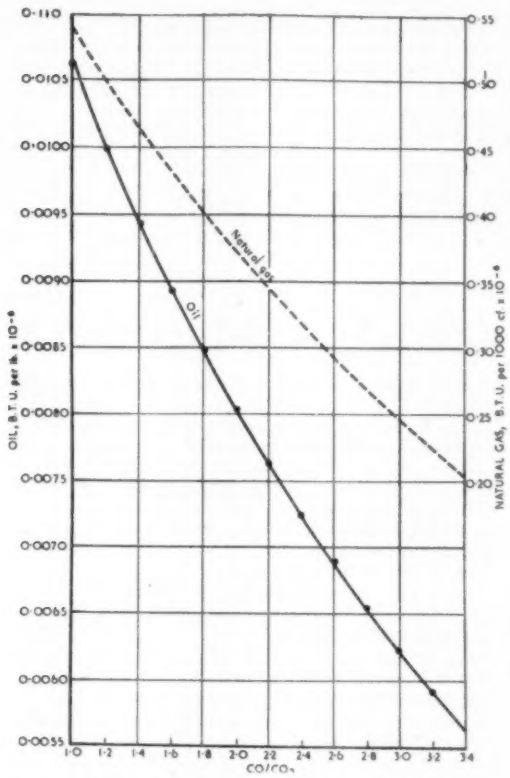

FIG. 4.—HEAT GENERATED BY OXIDATION OF NATURAL GAS OR OIL TO VARIOUS CO/CO_2 RATIOS.

Then heat in blast $= B_1 \times T_1 \times K_1$ B.t.u. where K_1 is given by the expression

$$\frac{T_1 + 9{,}570}{294{,}100}$$

Heat in blast $= B_1 \times T_1 \times$

$$\left(\frac{T_1 + 9{,}570}{294{,}100}\right) \times 10^{-6} \text{ million B.t.u.} \quad (6)$$

(*b*) Sensible heat in waste gas

B_1 = blast volume/ton.

T_2 = waste gas temperature, deg. C.

$\therefore$ Waste gas/ton $= W_1 = \frac{79}{57} \times B_1$ (to a first approximation).

Then heat in waste gas $= W_1 \times T_2 \times K_2$ B.t.u.

where $K_2 = \frac{T_2 + 6{,}751}{198{,}010}$

Sensible heat in waste gas $= W_1 \times T_2 \times$

$$\left(\frac{T_2 \times 6{,}751}{198{,}010}\right) \times 10^{-6} \text{ million B.t.u.} \quad (7)$$

(*c*) Heat to decompose moisture in blast

M = moisture in blast, gr./cu. ft.

Quantity of moisture/ton (L)

$= M \times B_1 \times 7{\cdot}93 \times 10^{-6}$ lb. mols.

If H = Hydrogen utilization per cent. (obtained from Fig. 2)

then heat needed to decompose steam

$= L \times 0{\cdot}001042 \times (1\text{-}H)$ million B.t.u. (8)

NET AVAILABLE ENERGY—Designating the net available energy as N, it is calculated from the foregoing values:—

$N = (5) + (6) - (7) - (8)$ ..... (9)

2.—*Calculation of Coke Rate for Injection Practice*

(*a*) Heat supplied by injectant

(i) *Natural Gas*:

I_N = cu. ft. of natural gas/ton iron

ΔT = increase in blast temperature from base

ΔM = decrease in moisture (gr./cu. ft.) from base.

Total effective temperature increase $= \Delta T + 20\Delta M$

Hydrogen injected as natural gas $=$

$$\frac{I_N}{454} \times \frac{28{\cdot}3}{23{\cdot}6} \times 2 \text{ lb. mols.}$$

$$= 5.28 \times 10^{-3} I_N$$

Change in H_2 injected as moisture

$= \Delta M \times B_1 \times 7{\cdot}93 \times 10^{-6}$ lb. mols.

$\therefore$ Increase in H_2 $=$

$5{\cdot}28 \times 10^{-3} I_N - \Delta M \times B_1 \times 7{\cdot}93 \times 10^{-6}$ lb. mols.

Knowing the increase in hydrogen in lb. mols. per ton of iron and the increase in effective blast temperature, the change in carbon monoxide utilization can be read directly from Fig. 1.

If this percentage change in CO utilization $= U$ and the CO/CO_2 ratio for the base practice $= R$

then the new CO/CO_2 ratio (R^1) $=$

$$\frac{100\,R - U}{100 \times U}$$

Knowing I_N and R^1 the heat from the injectant (10) can be found from Fig. 4. This is drawn from calculated values of the heat evolved by the combustion of CH_4 to various CO/CO_2 ratios and the appropriate H_2/H_2O ratio

(ii) *Oil*: I_O = lb. oil/ton iron.

As (i) increase in effective blast temperature $= \Delta T \times 20\Delta M$ and increase in hydrogen injected

$$= \frac{H_O I_O}{200} - \Delta M \,.\, B_1 \,.\, 7{\cdot}93 \times 10^{-6},$$

where H_O = hydrogen content of oil, per cent.

From Fig. 1 the change in CO utilization can be found and, as above, R^1, the new CO/CO_2 ratio. From this and Fig. 4 the heat from the injected oil (10) can be found.

(iii) *Steam*: From the increase in the lb. mols of H_2 and the effective blast temperature increase, the increase in CO utilization can be found from Fig. 1. From this the new CO/CO_2 ratio (R^1) can be found, as before, and from this, the new per cent H_2 utilization.

(*b*) Heat from blast

The following approximate formulae, linking percentage change in blast volume with percentage change in carbon monoxide utilization, has been derived from the available injection data.

$$\Delta B_1 = -1{\cdot}33\,U$$

where ΔB_1 = per cent. increase in blast volume/ton

TABLE 1.—*Two Examples of the Calculation, One (Fairless) for Natural Gas Injection with a High Degree of Temperature Compensation, and the Other (Dofasco) for Oil Injection with a Comparatively Low Degree of Temperature Compensation.*

Furnace.	Coke rate, cwt./ton.	Lb. atoms of carbon.	Lb. atoms of carbon in pig.	Lb. atoms of carbon in flue dust.	Lb. atoms of carbon with CO_2 from carbonate.	Lb. atoms of carbon for heating and reduction.	Millions of B.t.u.						Production at initial blowing rate (ton/day).	
							Heat from carbon.	Sensible heat of blast.	Sensible heat in top gas	Heat to decompose water.	Net available energy.	Heat from injectant.		
Fairless: Base ..	12.50	108.46	6.72	0.62	1.22*	99.90	9.29	2.14	0.84*	0.51	10.08	—	1,830	—
Fairless: Injection prediction ..	10.23	88.26	6.72	0.62	0.99	79.93	7.77	2.33	0.73	0.06	10.08	0.77	2,130	—
Fairless: Injection actual .. .	9.97	—	—	—	—	—	—	—	—	—	—	—	2,153	(2,110 at lower blowing rate)
Dofasco: Base ..	15.03	128.17	8.12	0.20	3.31	116.54	10.79	2.34	0.76	0.44	11.93	—	1,040	—
Dofasco: Injection prediction ..	13.31	113.50	8.12	0.20	3.23	101.95	9.38	2.61	0.78	0.49	11.93	1.21	1,020	—
Dofasco: Injection actual .. .	13.28	—	—	—	—	—	—	—	—	—	—	—	1,068	(1,085 at higher blowing rate)

* Based on estimates of stove rate and top gas temperature.

U = per cent. increase in CO utilization

$$\therefore \text{Heat from blast} = \frac{B_1}{100}(100 + \Delta B_1) \times T^1_1 \times K_1$$

$$= \frac{B_1}{100}(100 + \Delta B_1) \times T^1_1 \times \left(\frac{T^1_1 + 9{,}570}{294{,}100}\right) \times 10^{-6} \quad \ldots\ldots \quad (11)$$

million B.t.u.

where T^1_1 = new blast temperature.

c) Heat lost in waste gases

$$\frac{B_1}{100}(100 + \Delta B_1) \times \frac{79}{57} \times T_2 \times \left(\frac{T_2 + 6{,}751}{198{,}010}\right) \times 10^{-6} \quad \ldots\ldots\ldots\ldots \quad (12)$$

million B.t.u.

(Top temperature is presumed to remain the same)

(*d*) Heat to decompose moisture in blast

M^1 new moisture in blast (gr./cu. ft.).

$$\therefore \frac{B_1(100 + \Delta B_1)}{100} \times M^1 \times 7{\cdot}93 \times 10^{-6}$$

$= L^1$ moisture/ton iron (lb. mols)

If H^1 is new hydrogen utilization, then heat for moisture decomposition $= L^1 \times 0{\cdot}001042 \times (1 - H^1)$ ..... (13)

Therefore heat to be supplied by burning coke carbon

$= N + (12) + (13) - (10) - (11)$

$= Q$

If C^1_4 = Carbon required for this

$$\text{Then } C^1_4 = \frac{Q}{\text{Heat per lb. mol. carbon (from Fig. 3) burning to new } CO/CO_2 \text{ ratio } (R^1)} \quad \ldots\ldots \quad (14)$$

The carbon in iron and carbon lost in flue dust are assumed to be as before. The carbon reacting with CO_2 from limestone is recalculated as follows.

For every 1 lb. atom of coke carbon saved $(C_4 - C^1_4)$ there is approximately 1·4 lb. coke ash or 0·9 lb. $(SiO_2 + Al_2O_3)$ less to furnace.

$\therefore$ approx. 0·9 lb. of CaO + MgO saved or approx. 1·6 lb. limestone.

$\therefore$ new limestone rate

$$S^1 = S - 0{\cdot}014(C_4 - C^1_4)$$

$$\text{and new carbon loss} = \frac{1{\cdot}12\,S^1R^1}{2 + R^1} \quad \ldots\ldots \quad (15)$$

where R^1 is the predicted new CO/CO_2 ratio.

$\therefore$ total carbon required.

$= C^1_4 + C_{\text{iron}} + C_{\text{flue dust}} + C_{\text{lime stone}}$ (15) lb. atoms

$= C^1$

$$\text{Coke rate} = \frac{C^1}{0{\cdot}0933\,C^1_1}$$

where C^1_1 = carbon content of coke

(or C_1 if the carbon content of the coke remains unchanged.)

3.—*Calculation of Production Rate for Injection Practice.*

Provided blowing rate remains the same, then the new production rate (P^1 ton /day) can be found from the new blast volume/ton pig by the following formula.

$$P^1 = \frac{100P}{(100 + \Delta B_1)}$$

Conclusion

This method of calculating the effect ofinjecting fuel into the blast furnace has been used to calculate the coke rate and production for a variety of practices where injection has actually been tried.

In most cases the predicted coke rate agreed with the coke rate actually obtained to within a few per cent. The accuracy of prediction of iron production rate is not so high because the empirical relationship on which this is based is only approximate. In any case the new operating conditions consequent upon injection may allow a change to be made in the blowing rate.

In Table 1 two examples of the calculation are

given, one (Fairless) for natural gas injection with a high degree of temperature compensation, and the other (Dofasco) for oil injection with a comparatively low degree of temperature compensation. These two cases represent extremes of injection conditions. It can be seen that the agreement between practice and prediction is quite good.

It is believed that this simple method of calculating the effect of the injection of steam or fuel on furnace operation will give a reasonably accurate indication of the results which will be obtained.

Carborundum Films

WELL produced and intelligently distributed and exhibited, industrial films can have a great impact on sales, in addition to being of educational value. The Carborundum Company, Limited, Trafford Park, Manchester, makes several industrial films every year, and its film "In the Rough" won an award at the recent Industrial Screen Film Festival. The company's three latest films deal, respectively, with ceramic-tipped tools, refractory materials, and grinding wheels.

"The Winning Tip" deals with one of the most startling developments in modern mechanical engineering, the use of the ceramic-tipped cutting tool, for which considerable savings in time and costs are claimed.

Latest of the Carborundum control films, "Heat in Harness," demonstrates how modern refractories serve the many industrial processes calling for precise control under high temperatures. From a modern research laboratory furnace to the baking of man's daily bread—from flame-out prevention devices in jet engines to the firing of fine-art pottery—the colour-camera passes over a wide and fascinating field. The abrasion resistance of "Carbofrax" bricks is demonstrated by shots taken at the National Coal Board's "Phurnacite" plant at Aberdare. The sole bricks in each oven have to withstand the abrasion of 4,000 tons of carbonized fuel per year at a temperature of 650 to 700 deg. C. Their life under these conditions is more than 10 years.

The finishing of racing car gears and astronomical mirrors to tolerances of less than 1 microinch is featured in "To Be Precise," a fascinating film with an entertaining commentary.

The three films are in 16 mm. sound and colour. Each runs for approximately 25 min.

OVERSEA TESTING of New Zealand iron-sand concentrate and coal will begin early in 1962, the Minister of Industries and Commerce, Mr. J. Marshall, has announced. The testing will be done by a number of companies in the United Kingdom, the United States, and Norway. The tests will enable the New Zealand Steel Investigating Company, Limited, with the assistance of its consultants, to decide on the steel production process best suited to the New Zealand raw materials and conditions.

Welding of Aluminium to Steel

SOME years ago a Russian engineer, G. A. Belchuk, reported the welding of aluminium cable to steel plate, but the results were inconclusive. His efforts have recently been more successful, however, and in 1959 he described two methods, both employing tungsten arc welding. In the first three layers of aluminium were deposited on steel having a coating of aluminium 0.04 in. thick, the filler wires 0.078 in. dia. being of aluminium and tungsten, respectively, the welding current being 110 to 130 amp., and speed of travel 4.7 to 9.4 in./min. In this case a well-developed layer of intermetallic compound 0.04 to 0.05 in. thick, was detected at the aluminium/steel junction. In another experiment aluminium was deposited in the same manner on galvanized steel, the film of zinc being 0.008 to 0.016 in., but the intermetallic layer was only 0.001 in. This junction was not as strong as the first.

While the latest experiments disclose that apparently sound joints are easy to make, the intermetallic compound ($FeAl_3$) at the junction of the weld is a problem because it is brittle and liable to crack.

This intermetallic phase is formed by a diffusion reaction which occurs when liquid aluminium reacts with solid iron along the line of contact. An operating difficulty is to protect the hot surface of the steel from oxidation, and a shielding atmosphere of argon has been employed with some success. Galvanizing by hot-dip or electrolytic methods are recommended, the zinc layer being 0.008 to 0.016 in. thick. The practical difficulties are obvious. The September 14, 1961, issue of Iron Age, from which the foregoing notes are extracted, points out that the welding of steel to aluminium is the subject of investigation at the Frankford Arsenal, Philadelphia, and that early reports indicate that the two metals can be welded by a variety of processes.

Vacation Course on Cathodic Protection

VACATION course on "Cathodic Protection—Instrumentation, Interference, and Interference Testing (organized with the co-operation of the Corrosion Group of the Society of Chemical Industry) is announced by the Department of Metallurgy of Battersea College of Technology. To be held on December 19 and 20, the course will cover the following aspects of the subject:—Types of tests used in cathodic protection; instruments and characteristics of instruments; commissioning and maintenance instrumentation; special topics—half cells, redox potentials, constant potentials; interference—theoretical principles, interference in practice. One lecture will be devoted to a survey of recent developments in this field.

Fee for the course is £6. Enrolment forms and further information may be obtained from the Secretary (Metallurgy Courses), Battersea College of Technology, London, S.W.11.

Forthcoming Events

NOVEMBER 11

Institution of Plant Engineers (Edinburgh Branch):—Meeting at 25, Charlotte Square, Edinburgh, at 7.30 p.m. "Gas in Industry," by A. Mackechnie, industrial gas officer, Scottish Gas Board.

NOVEMBER 13

Lincolnshire Iron and Steel Institute:—Meeting at the North Lindsey Technical College, Kingsway, Scunthorpe, at 7.30 p.m. "Production and Distribution of Tonnage Oxygen at Appleby-Frodingham," by G. Gibson, plant engineer, oxygen plant, and W. Calvert, assistant fuel engineer and services officer, Appleby-Frodingham Steel Company.

Institution of Electrical Engineers (Scottish Branch):—Meeting at the Royal College of Science and Technology, Glasgow, C.1, at 6 p.m. "Numerical Control of Machine Tools," by D. F. Walker.

Institution of Production Engineers (Halifax and Huddersfield Section):—Meeting at the Percival Whitley College of Further Education, Francis Street, Halifax, at 7.30 p.m. "Design and Development of Machine Tools," by C. A. Sparkes.

NOVEMBER 14

Illuminating Engineering Society (Glasgow Centre):—Joint meeting with the Association of Mining Electrical and Mechanical Engineers at 6 p.m. "The Mining Electrical Engineer Looks at Lighting," by J. Rae.

Institution of Electrical Engineers (Scottish Centre: Electronics and Measurement Group):—Meeting at the Carlton Hotel, Edinburgh, at 7 p.m. "Numerical Control of Machine Tools," by D. F. Walker.

Institution of Production Engineers (Doncaster Section):—Meeting at the Technical College, Waterdale, Doncaster, at 7 p.m. "Synthetic Fibres Used in Engineering," by Mr. Lonsdale.

Institution of Plant Engineers (Manchester Branch):—Meeting at the Manchester Literary and Philosophical Society, George Street, Manchester, at 7.15 p.m. "High-pressure Hot-water Systems," by A. E. Lock.

Institution of Chemical Engineers (North-Western Branch):—Meeting at the Manchester College of Science and Technology, Jackson Street, Manchester, at 3 p.m. Papers on "Chemical Reaction Engineering."

Institution of Chemical Engineers (South-Eastern Branch):—Meeting at the Geological Society, Burlington House, Piccadilly, London, W.1, at 5.30 p.m. "Underground Gasification of Coal," by F. E. Warner, J. Szekely, and R. S. H. Mah.

NOVEMBER 15

Mining Institute of Scotland:—Meeting at the Royal College of Science and Technology, George Street, Glasgow, C.1, at 5.15 p.m. "The Remote Control of Powered Roof Supports," by J. D. Kibble (Mining Research Establishment, Isleworth).

Institute of Fuel (Yorkshire Section):—Meeting at the Memorial Hall, City Hall, Sheffield, at 2.30 p.m. "Present and Future Developments in the Gas Industry," by Sir Henry Jones.

Institute of Welding (West of Scotland Branch):—Joint meeting with the Scottish Branch of the Institution of Structural Engineers at the Institute of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2, at 7 p.m. "Who Teaches the Science of Welding?" by Dr. J. Orr.

Royal Society of Arts:—Meeting at John Adam Street, Adelphi, London, W.C.2, at 6 p.m. "Engineering and Architecture," by Prof. Ing. Riccardo Morandi. Tickets available from the secretary.

Society of Chemical Industry (Corrosion Group):—Meeting at 14, Belgrave Square, London, S.W.1, at 6 p.m. "A controversial evening to ventilate outstanding points of doubt and dispute in corrosion science."

Institution of Production Engineers (Birmingham Section):—Meeting at the James Watt Memorial Institute, Birmingham, at 7 p.m. "Some Aspects of the Design of Machine Tools and Automation Equipment for the Future," by F. A. Lewis.

Institution of Plant Engineers (East Midlands Branch):—Meeting at the County Hotel, Theatre Square, Nottingham, at 7 p.m. "Coal Utilization," by D. Hicks, carbonization and scientific director, East Midlands Divisional Coal Board.

Institution of Plant Engineers (Kent Branch):—Meeting at the Railway Hotel, Dartford, at 7 p.m. "Hydraulic Control Systems," by J. C. Wells.

NOVEMBER 16

South Wales Institute of Engineers:—Meeting at Park Place, Cardiff, at 6 p.m. "Some Problems of Shaft Inset and Pit-bottom Roadway Construction at Abernant Colliery," by T. V. Thomas.

Combustion Engineering Association (Western Region):—Meeting at the Seabank Hotel, Porthcawl, at 10 a.m. "Shortcomings of Combustion Equipment," by Prof. M. W. Thring (University of Sheffield).

West of Scotland Iron and Steel Institute:—Meeting at the Institute of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2, at 6.45 p.m. Junior members' night: Papers on "Marking, Cutting, and Testing of Steel."

Institution of Production Engineers (Glasgow Section):—Meeting at the Institute of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow, C.2, at 7.30 p.m. "Chipless Turning," by E. J. Bennett.

North of England Institute of Mining and Mechanical Engineers:—Meeting at Neville Hall, Newcastle-upon-Tyne, at 4 p.m. "Methane Layering," by T. E. James and J. L. Purdy.

Institution of Mechanical Engineers (East Midlands Branch):—Annual dinner and visit by the president of the institution, Sir Kenneth Hague.

Institution of Production Engineers (Reading Section):—Meeting at the Great Western Hotel, Station Road, Reading, a 7.30 p.m. "Cost Control for the Production Engineer," by F. G. S. English.

Institution of Plant Engineers (Blackburn Branch):—Meeting at the Castle Hotel, Blackburn, at 7.30 p.m. "The Free Piston Engine," by W. Lowe.

NOVEMBER 17

Institute of Marine Engineers (Scottish Section):—Joint meeting with the Aberdeen Mechanical Society at Robert Gordon's Technical College, Aberdeen, at 7.30 p.m. "Elementary Nuclear Engineering," by H. F. Close.

Junior Institution of Engineers:—Meeting at Pepys House, 14, Rochester Row, Westminster, London, S.W.1, at 7 p.m. "Some Notes on Early Marine Diesel Engines," by E. E. Burrage.

NOVEMBER 20

Institute of Marine Engineers (South Wales Section):—Meeting at the South Wales Institute of Engineers, Park Place, Cardiff, at 6 p.m. "Marine Machinery Breakdowns," by J. H. Milton.

Institution of Electrical Engineers (Sheffield Sub-centre):—Meeting at the Angel Hotel, Brigg, at 7 p.m. "A General Theory of Depreciation of Engineering Plant," by D. Rudd.

Institution of Electrical Engineers:—Meeting at Savoy Place, London, W.C.2, at 5.30 p.m. Discussion on "Electrical Accidents and their Causes, including the Legal Aspects."

Institution of Mechanical Engineers (Industrial Administration and Engineering Production Group):—Meeting at 1, Birdcage Walk, London, S.W.1, at 6 p.m. Discussion on "Mechanical Handling of Small Parts with Special Reference to Automatic Assembling Equipment."

Royal Society of Arts:—Meeting at John Adam Street, Adelphi, London, W.C.2, at 6 p.m. Cantor Lecture: "Exports and the Country's Economy," by J. L. S. Steel, chairman, Overseas Trade Policy Committee, Federation of British Industries. Tickets from the secretary.

Institution of Production Engineers (Coventry Section):—Meeting at the Craven Arms Hotel, High Street, Coventry, at 7 p.m. "Technique on Fine Boring," by J. R. Judkins.

National Association of Colliery Managers

NOVEMBER 13

Midland Branch:—Meeting at West Notts Technical College, Mansfield, at 6.30 p.m. "The Marketing of Solid Fuel from the East Midlands Today and in the Future," by N. Fricker, marketing director of the East Midlands Divisional Coal Board.

NOVEMBER 18

North Staffs Branch:—Annual dinner and dance at the North Stafford Hotel, Stoke-on-Trent.

NOVEMBER 21

Yorkshire Branch:—Meeting at the Miners' Welfare Hall, Brodsworth, at 3 p.m. "Manpower Deployment," by J. Claxton-Smith.

NOVEMBER 22

Lancashire Branch:—Meeting at the Manchester Literary and Philosophical Society, 36, George Street, Manchester, at 3 p.m. Lord Robens, chairman of the National Coal Board, will give an address on current affairs in the industry.

NOVEMBER 24

Kent Branch:—Meeting at the Swan Hotel, Deal, at 7.15 p.m. "A New Look at Safety," by W. A. Wood, chief safety engineer, NCB.

On Monday of last week, during the special meeting of the Iron and Steel Institute in Canada and the United States, members visited the Aliquippa Works of the Jones & Laughlin Steel Corporation.

With the ISI in

CLEVELAND AND DETROIT

from C. W. J. CRAWFORD
(Metallurgical Editor)

FOLLOWING on the visits to the Canadian steel plants, members of the Iron and Steel Institute split into two groups, one for Cleveland and the other for Detroit. The journey by road to Detroit was in sunshine, except for the duration of a short thunderstorm. At Windsor, on the Canadian-American border, passports had to be shown once more, and it was also the moment for watches to be put back one hour.

Our first morning in Detroit provided an opportunity to visit the ASM Metals Exposition in the Cobo Hall, a very modern exhibition and conference centre. The layout of the exhibition was exceptionally attractive. We walked down carpeted aisles in a cool and fresh atmosphere; all too frequently one finds that American air conditioning and central heating result in an overheated atmosphere.

One of the most spectacular exhibits was a long crystal bar of hafnium weighing 326 lb. This was shown by the Nuclear Materials & Equipment Corporation (NUMEC), which claims that the production technique for this pure form of hafnium would be applicable and economic for producing pure titanium, zirconium niobium, chromium, and silicon.

In the afternoon a visit was made to the new 80-in. hot-strip mill of the Great Lakes Steel Corporation, which started running-in tests in September and was formally commissioned on October 19. This mill, regarded as "the mill of the future," has been designed for high productivity. It is amply powered to roll slabs weighing up to 32 tons to automobile sheet and tinplate. The combined power of its seven finishing stands is 54,000 h.p., the maximum speed of its seventh stand being 3,000 ft./min.

One reason for regarding it as the mill of the future is that it is equipped with an electronic computer system that will enable its operation to be programmed and controlled from the moment the slab leaves the slab furnace until the strip is coiled. Eventually, the control system will be extended to include the slab-heating furnaces.

The system consists of many subsidiary measuring and control devices, an important one of which is the automatic gauge control (AGC) system developed by BISRA and Davy-United Instruments, Limited. Special attention to maintenance and repair has been given during the designing

of this mill; for instance, the three down coilers are constructed so that each can be retracted individually into a recess for repair while the other two remain in operation.

The Detroit group made an early start by air to Cleveland the next day and thence by bus to the alloy steelworks of the Republic Steel Corporation at Massilon and Canton in Ohio. The combined annual capacity for alloy and stainless steel of these works exceeds that of any other company. Stainless steel sheet capacity, now nearly 9,000 ton/month, is achieved principally by 27-in. and 49-in. Zendzimir mills supported by six 4-high reversing cold mills and several skin-pass and temper mills. For further processing there are 18 annealing and pickling lines. Recently a continuous bright annealing line has come into operation and this is producing a "mirror finish" sheet. The visit to these works made one realize how widely stainless steel is accepted as a "mass-fabrication" material: it appears that its use is still growing rapidly.

On Saturday, October 28, as a complete change from steelworks' visits, most members went to see a game of American football, having previously attended a talk in the hope of being able to follow the play better. It was a sunny afternoon, more suitable for cricket than football, and the showmanship of the bands of the opposing teams—Pittsburgh University and the US Navy—together with the antics of the cheer-leaders, proved highly entertaining, as, indeed, did the football!

Hospitality Returned

In the evening, cocktails, buffet supper, and dancing as the guests of Sir Charles Goodeve, president of the Iron and Steel Institute, and Lady Goodeve was a memorable occasion. Previously during the tour members had frequently been guests of Canadian and American companies and institutions, and, in the words of the president, had had a feast of technology, food and wine, and good fellowship. It was therefore a pleasure to repay the generous hospitality in some measure.

On the following Monday we resumed our programme with a visit to the Aliquippa Works of the Jones & Laughlin Steel Corporation. The large variety of products made at this integrated steelworks includes hot-rolled bars, seamless and welded pipe, sheet and strip, tinplate, wire, and wire nails. Several items of the plant have been installed within the last five years. Notable among these are top-blown oxygen plant and 44-in. strip mill, two continuous weld mills, an electric weld mill, a continuous annealing line, and a new 13-ft. 2-in. wide sintering machine. Also, the plant has some good examples of the present trend towards automation.

In the top-blown oxygen process the finishing temperature is kept to within narrow limits by using a computer to calculate the weights of materials for the charge and cooling additions in accordance with equations based on a heat balance and the desired slag and metal end-compositions.

On the strip mill the operation of the reversing rougher is fully automatic, hot slabs, about 9 tons in weight, being rolled from a thickness of 5½ to 7½-in. down to 0.9 in. The system, known as "PRODAC" (Programmed Digital Automatic Control), operates according to a punched card programme. Cards punched with the slab size, strip size, grade of steel, and chosen drafting and rolling speed of the slabs to be rolled are inserted into the card reader and, by pressing the "schedule advance" button, data from the cards are transferred to the programming equipment. On pressing the "pass advance" button the mill is set for the first pass and after the slab has gone through the rolls the settings for each successive pass are made automatically. A maximum of nine passes can be scheduled. Operated in this way the mill runs more smoothly and with greater precision than with manual operation.

The recently installed continuous annealing line is 330 ft. long and operates at speeds up to 2,000 ft./min. Data on strip gauge, temperature, and speed are now being accumulated electronically, the ultimate objective being to link such data to a computer for regulation of temperature and speed.

The observation of numerous items of plant at this large works might well have proved exhausting, but good organization avoided this.

Homestead and Duquesne Works

There was quite a selection of plant installations that members could visit on the following day and one had inevitably to miss something of interest. Many of us decided that the plate mill at the Homestead Works and the electric plant and vacuum degassing plant at the Duquesne Works of the United States Steel Corporation were not to be missed. Homestead is an integrated plant which started production in 1879 and added to its facilities from time to time. The great contrast between this works and the Fairless Works, built in 1953 by the same company, is brought out by figures for tons of steel produced per acre per annum, which are roughly 10,000 and 750 for Homestead and Fairless, respectively.

Homestead's total output, some 4,400,000 tons annually is made by the open-hearth process and the works has the greatest concentration of open-hearth furnaces in the world. No. 5 open-hearth plant, which was part of a large expansion programme during the last war, has 11 325-ton furnaces. They are fired with tar and oil and each has two oxygen roof lances: they produce steel at the rate of 40 ton/hr.

The 160-in. plate mill was also part of Homestead's wartime expansion. During our visit it was rolling large slab ingots in tandem and in such circumstances could roll 5,500 ton/8 hr. turn; the average output per turn is about 2,800 tons. To improve the product of this plate mill heat-treating lines were installed in 1957 and since then an increasing proportion of the plate output has been of quenched and tempered quality. As a result of the good customer response to the availability of quenched and tempered plate, a second continuous quenching and tempering line has since been installed. At present about 25 per cent. of

the total plate produced is treated in these lines.

The vacuum degassing plant at the Duquesne Works had, unfortunately, finished processing for the day, but we were able to inspect it. It is a large installation, capable of processing ingots up to 250 tons in weight. Steam ejectors are used for evacuation.

The Duquesne electric shop of one 20-ton, one 45-ton, and three 85-ton arc furnaces produces alloy steels. Steel for large forgings is vacuum degassed. The 45-ton furnace was undergoing a trial with a fume exhausting system made up of a suction duct in the roof which draws off the fume from the furnace chamber and passes it to a bag filter cleaning plant. There were hoods over the doors to lessen escape of fume. The charge was at the refining stage during our visit and there was little escape of fume, but this stage of the process does not offer a severe test. When a satisfactory design and operating technique has been worked out all the furnaces of the shop are to be equipped similarly.

At National Forge

On Wednesday morning we journeyed some 150 miles by bus to Warren, Pa. The route followed the valley of the Allegheny river into well-forested and mountainous country. The autumn tints were still a pleasant sight, but less vivid than they had been a week before. Our objective, a visit to the National Forge Company, an integrated producer of forged products, was an important one because the company processes most of its steel through a Dortmund-Hörder vacuum degassing plant. The plant is in regular use and two electric furnace heats were vacuum degassed during our visit.

The whole procedure went smoothly. At the completion of tapping a 10½-ton charge a bag of vermiculite was thrown on the surface to consolidate the slag and reduce heat loss. The ladle was placed on the hydraulic lifting platform at the degassing station and moved under the degassing vessel. After taking an immersion temperature (1,580 deg. C.) of the steel the platform and ladle were raised until the nozzle of the degassing vessel was immersed a few inches in the steel. The operator then set this position on a limit switch device and raised the ladle until most of the nozzle was immersed in the steel. This highest position of the ladle was then set on a limiting switch and evacuation of the degassing vessel was started. As soon as the pressure had been reduced to 5 mm. of Hg the vessel was lowered to its lower limits and raised again to its upper limit. Meanwhile, the evacuating pumps had reduced the pressure to less than 2 min. of Hg and caused the steel to rise some 4½ ft. up the nozzle just into the chamber. After the first two or three strokes (down and up movement of the ladle taking about 40 sec.), which were controlled manually, further movement was automatic. With each downward movement about 1½ tons of steel enters the vessel and a surge in the pressure occurs as gas comes off. These pressure surges become weaker with succeeding strokes. When there is no pressure surge degassing is complete.

In the heat observed degassing was complete after about 15 strokes (10 min.). Additions of alloys were then made to the degassed steel from vacuum-sealed chambers in the top of the vessel and the stroking movement was repeated three or four times to "mix" the dissolved alloys and cause further degassing. At the end of this procedure the hydrogen content of the steel is usually less than 2 p.p.m. The vacuum chamber was then flushed with nitrogen, brought to atmospheric pressure, and the ladle lowered clear of the nozzle and transferred for teeming, a further temperature measurement being made. For the heat observed the fall in temperature was 21 deg. C. This small fall of temperature is achieved by supplying heat to the upper part of the vessel throughout the whole process from a horizontal carbon resistor rod above the metal.

An essential feature of this process is the provision of a rapid means of evacuating the vessel. At National Forge this is done by steam ejectors. The plant has been in operation since last December and interesting data on performance have been collected. Tests have shown that the hydrogen content at tapping for high-carbon steels was 3.5 p.p.m. or greater for about 60 per cent. of the tests, and for almost all the remainder of the tests ranged from 2.5 to 3.4 p.p.m., whereas after degassing, samples taken at the end of teeming, the heat gave no hydrogen contents over 3.4 p.p.m. and about 60 per cent. contained less than 2.0 p.p.m.

With regard to oxygen at tapping, about 75 per cent. of the tests had between 16 and 50 p.p.m. and the remainder between 51 and 85 p.p.m., whereas degassed steel showed about 50 per cent. of the tests in the 6 to 15 p.p.m. range and 50 per cent. in the range 16 to 30 p.p.m. Other marked advantages shown by vacuum processed heats were substantial increases in the recovery of silicon and in the ductility of the steel.

Forging Diesel Locomotive Crankshafts

A unique multi-directional press at present in use for forging diesel locomotive crankshafts, but applicable to other forging operations and to extrusion and piercing operations, was also working during our visit to the National Forge Company. This press has two 4,000-ton upsetting strokes and a 1,100-ton offset stroke.

Members saw Cr-Mo steel shafts of 8 in. dia. and 17 ft. length being forged to crankshafts. The shaft was placed with the part to be forged in the heating zone of a horizontal induction furnace. On reaching 1,160 deg. C. it was removed and placed with its heated portion in the upsetting and offsetting dies of the machine and the dies were then closed. This was done manually, but the subsequent offsetting and upsetting operations were carried out automatically. In two to three minutes the forging of one "throw" of the crankshaft was completed. Repetition of the cycle heating and forging, which takes about 20 min., would be required a number of times according to the type

of crankshaft. This forging machine, designed especially to the requirements of the company, is the only one of its kind.

It was exhilarating to see it in operation and contrast it with the conventional, time-consuming and laborious forging of a crankshaft by a hydraulic hammer.

US Steel Research Programme

SPECIAL steel research projects are planned by the Bureau of Mines, US Department of the Interior, during the fiscal year 1962, which began on July 1. The programme is aimed at developing new steels for high-strength and low-temperature applications. Metallurgists will seek more information on high-temperature reactions, the refining of molten pig-iron directly to steel, and the use of uranium as an alloy. In its quest for super-strength steels, the bureau will study strain hardening, surface energy forces, precipitation, cohesion, and other variables. To aid steel-mill metallurgists, it will make high-temperature measurements of physical and chemical properties of ferrous metals and slag systems, such as activity coefficients, heat contents, vapour pressures, and surface tensions. The research on refining molten pig-iron to steel will occur chiefly in a vortex cone reactor designed by the bureau. Attempts will be made to remove impurities with oxygen, lime, and other additives. The alloying properties of depleted uranium will be observed through use of an electron probe analyser and by measuring corrosion resistance, high-temperature properties, hardenability, and fatigue strength.

The bureau's newly developed hot-twist tests for evaluating the hot-working characteristics of steel will be tested commercially. Methods for removing contaminants from iron and steel scrap by melting, volatilization, formation of flaking scale, and other procedures will occupy other research staff, along with methods for increasing the quantity of scrap in oxygen converter steelmaking through the use of solid fuels.

In the bureau's experimental blast furnace, the behaviour of various iron-bearing feed materials and different fuels will be investigated.

Staffing the Mining Industry

"Staffing the Industry to Meet Today's Problems" was the title of Mr. Noel Gee's address at the meeting of the Midland Branch of the National Association of Colliery Managers at Mansfield on October 16. Mr. Gee is industrial relations director of the East Midlands Divisional Coal Board and his address was followed by keen discussion.

Blast-furnace Hot-blast Stove Test

A survey of temperature distribution on a hot-blast stove unit has been completed at Stewarts and Lloyds, Limited, Corby, using a Honeywell 40-point data handling unit. By means of a pinboard-programming system the unit processed temperature information on to punched tape, for subsequent computer analysis. The investigations were carried out by Stewarts and Lloyds in collaboration with the British Iron and Steel Research Association, and this is the first stove in the UK to be so studied. The data handling unit worked over a period of 10 days under dusty conditions, although it was not designed for such use.

Cylindrical Pressure Vessels and Tubes

IN power plant operating at high temperatures and pressures, the working conditions are frequently such that, during the life of the pressure vessels and tubes, both creep and elastic strain in them will be important. In general, however, the design of such cylindrical pressure vessels and thick-walled tubes has been based either on considerations of creep strain only or, in some cases, on elastic strain only. In either case the other factor, which may actually be important, is ignored.

It is clearly desirable to be able to take account of both creep and elastic strains when they are of comparable magnitude. An analysis, based on the transition from pure elastic to virtually pure creep conditions, which occurs in service, would represent a large number of practical cases more correctly than existing methods.

A theoretical relation has therefore been derived at the National Engineering Laboratory to relate stress, strain rate, and time with position along the radius and axis of the vessel or tube. This has been based on creep-strain/time relations obtained experimentally at the laboratory, over a number of years, for a variety of engineering materials under complex stresses.

This theory has been applied to estimate the values of principal stresses and strain rates in tubes for representative cases of six materials at temperatures within their practical working range. In particular, these predictions have been compared with those obtained from elastic theory, and from the pure creep theory of Bailey which has been much used in practice. The comparison indicates that, for the materials investigated, neither elastic theory nor pure creep theory adequately represents the changing stress distributions and strain rates that occur; although after considerable periods of time, upon completion of stress redistribution, values based upon the Bailey pure creep theory would not be seriously in error.

A complete example of the application of this general theory has been worked out in detail for a 0.2 per cent. carbon steel at 450 deg. C., as an aid to designers who may wish to use this method.

Further information is given in "Behaviour of Metallic Thick-walled Cylindrical Vessels or Tubes Subject to High Internal or External Pressures at Elevated Temperatures," a paper (Ref. 8/5) by A. E. Johnson, J. Henderson, and B. Khan, available from the Department of Scientific and Industrial Research, National Engineering Laboratory, East Kilbride, Glasgow.

A BRUSSELS REPORT states that Forges de Clabecq had a crude steel output in the year ended June 30, 1961, of 587,787 tons, against 570,209 tons in the previous year. The company is planning to build a new LDAC plant, a plate mill, and a sixth blast furnace.

POSITION OF COAL IN ELECTRIC POWER GENERATION

Tenth Coal Science Lecture

The British Coal Utilization Research Association's Tenth Coal Science Lecture was delivered in London on October 11 by Mr. L. Rotherham, M.Sc., F.Inst.P., F.I.M., F.Inst.F., member for research of the Central Electricity Board. A summary of the lecture is given below.

EXISTING position of coal in the generation of electricity is easily indicated by a statement of the relative consumption figures of oil and coal. Coal accounts for about 84 per cent. of all fuel consumed by the Generating Board, but in 1957 the figure was over 95 per cent. and by 1965 it may fall to 80 per cent. Whether the change in the pattern of fuel consumption will differ markedly from the trend indicated by these figures depends on many economic and technical factors which could act either to favour coal or against it.

Economic Assumptions

The changes in the electrical load demand in England and Wales are fairly clear. There is the steady increase in load and maximum demand which at the present time varies only slightly from the historical trend of a 7 per cent. increase per annum in maximum demand. At the same time, the number of units sold increases at a slightly faster rate as the annual load factor improves, but the distribution of load in different areas of the country remains much as before. If anything, the consumption in areas adjacent to London and the south coast tends to increase at a rather higher rate than in the northern areas adjacent to the coalfields. It is in these southern areas and also in the high coal cost area in the North Western Region of the Generating Board that oil has already made inroads into the position of coal as the dominant fuel for power generation. One fundamental reason for this is that oil is more readily transported than coal, and research on fuel transport could help coal to regain its position.

Oil will continue to be a strong competitor for coal in that it also has a lower impurity content and is more readily handled. This leads to lower capital costs for oil-burning stations which must be offset by a difference in the basic price of the fuel. Additionally, the solid waste from coal-burning stations must be disposed of at a minimum cost and preferably for some useful application and a great deal of work on ash problems is possible.

Apart from oil, coal must face the competition of nuclear energy. So far, the early predictions of the fall in capital cost of nuclear stations have been justified and, although at present they are uneconomical compared with coal-fired stations, it seems inevitable that the total costs of generation will move in favour of nuclear energy and it will take up some increasing part of the load. This will be on economic grounds as opposed to the existing policy considerations.

It is worth noting, however, that the date when nuclear energy becomes truly competitive has been pushed back by several years, not because our predictions on nuclear side were wrong but because on the Coal Board side the rise in the price of coal has been less than had been assumed, whereas on the generating side thermal efficiency has been progressively improved while capital costs have fallen. Progress in the development of conventional plant has been more rapid than had been assumed in the early days of nuclear energy, and if this can be maintained the date of the large-scale installation of economic nuclear power might be still further delayed.

Technical Problems

Fuel Transport

The price of coal at the pithead of our best collieries is competitive with oil prices, but the cost of transport tells heavily against it and in favour of oil in certain parts of the country. Electricity is cheaply transported, especially on high-voltage lines operating on a high rating, and there has been a tendency to build new large power stations in the cheap coal areas and to transmit large blocks of power to the load-consuming areas. The merits of this compared with movement of fuel in other forms has been studied and it seems likely that other means of transport have advantages in some circumstances. In particular, the use of direct current transmission and hydraulic transport of coal are being investigated in detail.

Ash Problems

There is no doubt that the ash in coal is a serious nuisance which has to be paid for, and equally

there is no doubt that at a price the ash problem can be dealt with. One aspect of the problem has been dealt with at BCURA over the years under the auspices of the Boiler Availability Committee. This work will be continued in the future by studies of the deposition and attack of the waste products of combustion on boiler parts. It is part of a wider programme of studies on combustion problems which is intended to give greater knowledge of how to use boiler plant more effectively.

One approach has been in the development of slagging combustion systems, the intention of this being to collect and remove the ash before it can come into contact with the boiler tubes. If this cannot be done, any ash should be carried through the boiler if possible and collected before discharge to the atmosphere. A great deal of research has been done on electrostatic precipitators and other forms of collectors.

There is no doubt that the ash has got to be collected and when collected it must be disposed of. Attempts have been made to incorporate it in bricks, lightweight aggregate, and for other civil engineering purposes, but one of its most interesting applications is in land reclamation. Considerable success has been obtained from research into the growing of crops on ash dumps.

Engineering Developments

The cost of fossil fuel power stations has fallen and the thermal efficiency at the same time has risen at a rate greater than had been anticipated only a few years ago. It is sometimes overlooked that increases in thermal efficiency require the use of more sophisticated designs and more expensive materials and the extent to which the marginal increases in capital costs implied by this are justified depends on the cost of fuel. If coal were a comparatively cheap fuel, as, for example, uranium is, marginal increases in thermal efficiency would be unnecessary and a further reduction in capital cost would have to be sought. However, since coal is relatively expensive, thermal efficiency improvements have to be developed. In part they can be obtained by research and development on the increase of steam temperatures and pressures, and the CEGB has ordered supercritical units for the Drakelow "C" power station. In addition, we are working on more advanced steam conditions and on the Field cycle as an alternative thermodynamic system to the Rankine cycle. It must also be noted that work on direct generation devices such as the fuel cell, thermionic, and, more particularly, magnetohydrodynamic generators, is best regarded as a means of improving thermal efficiency and that it is not inconceivable that efficiencies in excess of 50 per cent. might be achieved. Some of these more advanced methods might be easier to devise using refined fuels, but the National Coal Board might well wish to help in the development of coal-fired direct generation devices.

Conclusions

Coal has an assured place in the generation of electric power at the present time, but what its position will be in 20 years will depend on the outcome of many studies which are going on at the present time. If all the research work proved successful, coal consumption for electricity supply could be expected to rise above 100,000,000 tons by 1970. On the other hand, if no further research was done, coal consumption would continue to rise for a time, but would then fall away as nuclear energy overtook it. Even so, consumption in 20 years' time would still be unlikely to fall much below the present level and marginal economies in utilization would have great economic significance.

The only conclusion we can reach is that a greater effort in research and development in the use of coal for power generation would be worthwhile if it could be made available.

Coal Samples from Antarctica

SAMPLES of Permian coals collected on Mount Faraway in the Theron Mountains, within the Falkland Islands Dependency territories, by Sir Vivian Fuchs, leader of the 1957 transantarctic expedition have been analysed by the division of coal research, Commonwealth Scientific and Industrial Research Organization. The results appeared in Coal Research in CSIRO, No. 14, August, 1961. Seven samples were collected, but only hand samples were available and it is not known how far they were representative.

The coal proved to be of high ash yield, ranging from 9.6 to 26.0 per cent. on an air-dried basis. Most of the mineral matter was finely divided clay and silica and one sample proved to be closely similar to vesicular high-temperature coke. All samples showed a low sulphur content from 0.1 to 0.6 per cent. and had no swelling and agglomerating properties.

Petrographic examination showed that, apart from one sample, all the antarctic coals examined were compact, and massive, with well-defined layering and a sub-metallic lustre, especially on surfaces parallel to the bedding plane. All the samples were of predominately carbonaceous material and had macerals of high reflectance and other properties indicative of extremely high rank, tending towards the anthracite end of the peat-anthracite series.

Examination of the optical properties revealed that, on the basis of reflectance values, two of the samples were more similar to graphite than normal coal. Further evidence suggested that the coals have been subject to high temperature in the order of 600 deg. C. for the least altered samples and 1,000 deg. C. for the sample similar to vesicular high-temperature coke.

A NEW BLAST-FURNACE PLANT at Hangö, in the south-west of Finland, has come into production. It has an annual capacity of 250,000 tons and iron ore will be obtained from a deposit beneath the sea near Jussarö, to the east of Hangö. The plant is owned by Koverhar Järnverk Oy, which, in turn, is owned jointly by the Swedish Kopparberes group and the Finnish Vuoksenniska company. The plant will supply open-hearth pig-iron to the steelworks at Domnarvet, Sweden, and Imatra, Finland.

NEW LITERATURE

HOUSE magazines, catalogues, brochures, and other publications received include those referred to below. Readers wishing to obtain a copy of any of the items should apply direct to the address given, at the same time mentioning this journal.

BRADLEY & FOSTER, LIMITED, Darlaston (Staffs)—The editor of Bradley's Magazine, J. R. Park, F.I.M., is the author of the main article in the autumn issue. His subject is "Fundamentals of Cast Iron and Cupola Practice." He also writes on "Properties of Castings and Casting Evolution" in the same issue.

F. J. EDWARDS, LIMITED, 359-361, Euston Road, London, N.W.1—At the FJE Machine Centre at Islington Park Street, London, N.1, are hundreds of used and new machines. Many of these machines, from the machine-tool section, are described in catalogue MT 1061. Each item is presented pictorially with only the necessary capacity mentioned. The company has recently increased the number of its UK agencies, and the latest machines from the Continent are describd in the catalogue.

WILLIAM ROSE, LIMITED, Hilyn Works, Lockfield Avenue, Brimsdown, Enfield (Middx)—Illustrated literature describing in detail the the company's range of P.T.F.E. products is now available. One of the brochures deals with polytetrafluoroethylene flexible hose assemblies in the "Hilflon" range and another with "Hilflon" P.T.F.E. tape, designed to function as a thread sealant in ribbon form. From the associated company, Hilyn Industrial Equipment Limited, comes a brochure describing the new self-sealing swivel joint for all reciprocating and rotary movement problems in rigid pipework.

JAMES GORDON & COMPANY, LIMITED, Dalston Gardens, Stanmore (Middx)—Latest publication from this company (catalogue No. 120) deals with a new electrical automatic control system for shell and small water-tube type boilers. The system, which is described in detail, combines the company's many years' experience in combustion control with robust, reliable standard units by Sauter, the combination having been utilized to produce an electrical system for small boilers which offers the same advantages as the well-known Gordon pneumatic equipment for larger installations.

CAMBRIDGE INSTRUMENT COMPANY, LIMITED, 13, Grosvenor Place, London, S.W.1—The company's new instrument assembly wing, officially opened by Sir Keith Joseph, Bt., M.P., Minister of State, Board of Trade, marks another stage in an expansion programme designed to meet the increasing demand for measuring instruments in science and industry. In connection with the opening of the new wing, the company has compiled a number of information sheets, dealing with "Boiler Feed Water Analysis," "Experimental Scanning Reflection Electron Microscope," "Development Work on X-ray Microanalysis," and several other subjects.

BRITISH TIMKEN, Duston (Northants)—There is a pronounced summer holiday atmosphere about many of the pages in the section of the October issue of Timken devoted to news of the UK division of the Timken Roller Bearing Company, of Canton, Ohio. Among the various features, George Tucker (auto shop foreman) poses the question: "Are you attracted by the idea of a holiday on the French Riviera, but hesitant to embark on such an adventure because you do not speak the language, or feel apprehensive about the cost?" Mr. and Mrs. Tucker and their son "took the plunge" and obviously had a great holiday. The rest of the magazine is interesting and well laid out.

EVERSHED & VIGNOLES, LIMITED, Acton Lane Works, Chiswick, London, W.4—Author of "The Use of the Pipe-type Conductivity Cell with Sea Water Distilling Plants," published in the autumn number of Evershed News is D. Poucher, head of engineering, thermal engineering division, Marshall, Sons & Company, Limited. Since H. F. Goodwin's article on "Mine Fan Instrumentation" was published in the last issue of the magazine, further information on the subject has been received from the National Coal Board and this is dealt with in the current issue, which also contains a short preliminary outline of Evershed instrumentation equipment at West Thurrock power station and other valuable features.

LLOYD'S REGISTER OF SHIPPING, 71, Fenchurch Street, London, E.C.3—Latest issue (No. 8, 1961) of 100 A1, a bulletin published by Lloyd's Register, includes "Nuclear Merchant Ships," by H. N. Pemberton, chief engineer surveyor, "Failure of Ships in Compression," by J.M. Murray, chief ship surveyor, and unsigned articles on "Polish Shipbuilding," "The Lizzie and Annie," and various other subjects. The Lizzie and Annie, by the way, is one of the oldest vessels in Lloyd's Register Book; she has just celebrated her 84th birthday. The records show that, in the course of her life, she has run aground three times, and been in collision seven times. The story of her chequered career makes entertaining reading.

STANTON IRONWORKS COMPANY, LIMITED, near Nottingham—People at Stanton are justly proud of their brass band; in fact, there are two bands, the junior band serving as a training ground for boys. The Stanton Band, well known to listeners to BBC programmes, was founded in 1919 and under its conductor, A. Lunn, it has won many prizes at contests, including the second prize in the Senior Cup Section at the 1961 Belle Vue Brass Band Festival. A colour photograph of the band playing at Alton Towers during the summer makes a delightful front cover for the October number of the Stantonian (1d.). Articles include "The Story of British Standards," by W. Toms, of the BSI, "Spun Iron Pipes at Sea," and many other interesting features.

UNITED ENGINEERING & FOUNDRY COMPANY, 948, Fort Duquesne Boulevard, Pittsburgh 22, Pa, USA—United Effort is the title of a quarterly magazine published by the company's employees; it is, in fact, "published under the direction of an 'Editorial Committee' for the dissemination of information on rolling-mill equipment and its uses and topics of current interest to employees and customers." The issue for the third quarter of 1961 contains one lengthy technical article ("Crown Control of Paper Calendars," by M. D. Stone, manager, research and development, and A. T. Liebert, research engineer), a short, humourous article ("Visitor from Outer Space," by W. P. Molnar), and several pages of brightly presented news from the various works of the company.

DAVID BROWN CORPORATION, LIMITED, Huddersfield—Mr. Allan Avison, deputy managing director of the corporation, completed 50 years with the company on

August 14 last. During his working life, which began as a Park Works office boy, he has contributed to the success of the organization in unparallelled measure. In the post-war years and even long before then he has been associated with virtually every major David Brown development at home and oversea. In September, Mr. Avison was honoured by Mr. David Brown, chairman and managing director, at a luncheon in London. Lord Boothby was among those present at the luncheon, which is reported in the October-December issue of Newsletter. The remaining pages are filled with other news of the group's activities.

SAMUEL FOX & COMPANY, LIMITED, Stocksbridge, Sheffield—Clay mining is the subject of the "Local Industries of the Past" in the autumn number of the Fox Magazine (3d.). W. A. Johnson, chief development engineer, United Steels' research and development department, Swinden laboratories, Rotherham, writes on "Railway Rolling Stock Couplings," to which the editor of the magazine adds as a postscript: "There are 750 rail vehicles of all kinds, including wagons and bogies, on Stocksbridge Works." Criticism of the new cover continues to be made in the correspondence column of the magazine. We would like to see larger type used for the main headings and more generous spacing throughout; apart from that, we find the quarterly issues of the Fox Magazine something to look forward to and enjoy.

BROKEN HILL PROPRIETARY COMPANY, LIMITED, Melbourne, Australia—New uses continually being found for stainless steel range from simple domestic appliances to complex industrial plant. Chesney Gardner (Commonwealth Steel Company, Limited, Newcastle) writes entertainingly on the subject in the August number of the BHP Review. It was in 1935 that his company produced the first stainless steel ever made in Australia, in the form of castings; at about the same time the company began to plan the installation of its special steel plant, incorporating both bar mills and hot-rolled sheet mills. These were completed and started operating in 1941, producing a wide range of stainless and heat-resisting steel sheets and bars, practically all of which, however, were required for defence purposes. Developments to date are traced by the writer. Among other articles are "Site Preparation for the Whyalla Steelworks," by K. Clothier, field engineer construction, Whyalla, and "Research Report: Coal and Coke," by J. A. Gregory, assistant chief works research officer, Newcastle Steelworks.

ROUND OAK STEEL WORKS, LIMITED, P.O. Box 3, Brierley Hill (Staffs)—George L. Chatham, editor of the Acorn, the company's quarterly magazine, obviously believes in the policy of letting the pictures tell the story. The art work in the autumn number is excellent, special mention being called for of the photographs by Douglas Heath used to illustrate the article on "Roll Turning" by H. R. Jeffery, roll designer. Among many other interesting features the issue contains the third and final part of B. W. Berry's "The Level New Furnaces: a Story of the Black Country." The final contribution to the series deals with "Steel at Round Oak." Those who do not consider that the photograph of the new building to house three gas-fired heat-treatment furnaces and seven bar-turning machines, now in the process of erection, makes a particularly attractive front cover will surely be compensated by the photograph by D. Keightly, assistant buyer, on the back cover. The caption reads: "In the heart of the countryside: as the crow flies less than two miles from Round Oak, a view by evening light, in the Enville Area."

RICHARD THOMAS & BALDWINS, LIMITED, 82, Brook Street, London, W.1—Britain's first rotor furnace, which went into its first stage of commissioning at Redbourn recently, is an interesting object. A photograph, spread over one and a half pages of the October number of Ingot (6d.), gives one a preview of what "looks at first sight like some giant piece of artillery, quiescent now, but heavy with the promise of action." The rotor process, a new development of steelmaking in this country, is an oxygen injection system in a horizontally rotating furnace. It is in use in Germany and South Africa. At Redbourn the furnace will be used as a prerefining vessel enabling steel output from the open-hearth melting shop to be increased, with an improved control over quality. Philip Nunan, associate editor, contributes an interesting feature on "Fluorspar," the story being illustrated by his own watercolours. Other excellent articles are to be found in the latest edition of this quarterly magazine.

Australian Steel Standards

FIRST Australian standard covering a wide range for carbon steels for general engineering purposes has been published by the Standards Association of Australia as AS No. G.7. Earlier Australian standards for steel have mostly dealt with materials for specialized applications, such as structural steels or boiler plates, and have defined quality primarily in terms of mechanical properties. This new standard classifies a wide range of steels in terms of chemical composition.

The range of steels and method of classification correspond to the BHP-AIS schedule introduced some time ago to describe carbon and carbon-manganese steels available from Australian sources of manufacture. The numbering system is an adaptation of the American SAE-AISI system, with a prefix letter indicating degree of killing or deoxidation and a suffix letter indicating special surface finishes. Tables are provided for rimmed carbon steels, semi-killed (balanced) carbon steels, fully-killed carbon steels, sulphurized free-cutting carbon steels, and carbon-manganese steels.

The schedules are accompanied by clauses enabling the specification to be used as a basis for purchasing. These include references to certificates, arrangements for testing and inspection, analytical variations, dimensional tolerances, and information to be supplied by purchasers in ordering.

This standard is the first to emerge from the programme of work being developed under the authority of the association's Iron and Steel Standards Co-ordinating Committee. This programme includes preparation of specifications for particular applications, such as rivet steels; specifications for particular forms, such as castings and sheet and strip, and further general schedules, such as for alloys steels.

Steel at the Building Exhibition

Stainless Steel in Architecture

IN the same way, and, indeed, for many of the same reasons, that the domestic use of stainless steel is spreading outside the kitchen into the living rooms of the home, so are architects now beginning to use stainless steel for major structural applications on buildings rather than merely as shop window decor. Modern developments in multi-storey buildings and curtain walling are largely responsible for this use of stainless steel, and an increasing number of new buildings have been completed in the last few years with a glittering facade of polished stainless steel. Among several in London, the most obvious is perhaps the Millbank development project.

Five British manufacturers are now able to offer curtain wall or cladding systems in stainless steel on a commercial basis, suitable for both industrial and prestige-type buildings. In addition, two companies are making stainless-steel windows and a third has one in development.

Examples at the Exhibition

Examples of these systems are to be seen at the Building Exhibition at Olympia, London (November 15 to 29), particularly at the stand of United Steel Structural Company, Limited, which is exhibiting in conjunction with its associates in the United Steel group, Samuel Fox & Company, Limited. In addition to major structural uses for stainless steel, in walling and windows, there will also be examples of cheap panel production by rubber die presses, and a display of stainless-steel tiles, now commercially available. An interesting new exhibit will be stainless-steel barbed wire, now a complement to stainless-steel chain-link fencing, which has been available for some years.

Stainless-steel curtain walling is developing rapidly in Europe, as travellers to Düsseldorf and Paris can testify, and it is thought by the steel industries of both Europe and the US that the architectural field is one of the most promising long-term markets. Some 50,000 tons of stainless steel will be consumed for building purposes in the US in 1961. Sheet and strip alone will take as much as 70 per cent. of the entire British output for these products for all purposes.

Because stainless steel is a relatively expensive material, many architects and property owners are inclined to discount its use in Great Britain without a thorough investigation of its potential advantages. Experience has shown, however, that by careful design buildings are not greatly increased in cost by the use of a material which has a fine soft metallic lustre and gives no trouble to keep clean, especially as this is largely done by the weather anyway.

From time to time, the query is raised whether stainless steel is in fact stain-free in building applications. Sufficient evidence of this, going back nearly 30 years, exists in the US to establish this beyond all question, providing it is regularly cleaned of the more sticky deposits of dirt, containing chlorides or sulphates. In fact, washing is all that is usually needed for cleaning and the appearance of a building will be governed rather by adhering dirt than by any rust stains due to neglect. However, even the possibility of pitting or slight staining can be guarded against by using a more corrosion-resistant stainless steel, containing an additional alloying element of molybdenum. Such an alloy resists all conditions of service and even with no cleaning there is no deterioration of the metal. This quality is used almost invariably in the UK, although in the US it is specified only for coastal applications.

British urban atmospheric conditions are gradually improving as the Clean Air Act comes into force and it is expected that eventually the standard, and slightly cheaper, stainless steel quality will be perfectly satisfactory for most applications. To be absolutely sure, however, the steel industry recommends the molybdenum-bearing quality for the time being.

APPLICATIONS IN BUILDING FOR STEEL SHEET

WIDE variety of applications in building for steel sheet, now in plentiful supply, is illustrated on the British Iron and Steel Federation's stand at the Building Exhibition.

While many components are fabricated from uncoated sheet, increasing use is being made of coated sheets, for example, pre-galvanized, electro-zinc, and plastic-coated, and sheets specially prepared for vitreous enamelling. A wide variety of colours and surface textures is available in both plastic-coated and vitreous enamel claddings.

Light steel sections cold formed from continuous sheet are used for the structure of the stand, as well as parts of the floors, partitions, and staircase, illustrating how great strength and stiffness may be obtained from light-gauge steel components by suitable design of the shape and cross-sections of the members.

A number of profiles are displayed, some of which are incorporated in the stand construction. Vitreous enamel and plastic-coated sheets are used as cladding material and expanded metal may be seen in the form of lathing, wall reinforcement, grilles, and balustrades. Galvanized and plastic-coated steel sheet is illustrated in use for ducting, flues, conduits, and light fittings, as well as rain-water goods, radiators, dust chutes, litter bins, and lift doors.

Book Review

The Miners in Crisis and War. R. Page Arnot. George Allen & Unwin, Limited, 40, Museum Street, London, W.C.1. 42s.

ROBIN PAGE ARNOT is bidding fair to become the historian of the British coal miner and most assuredly of his trade union. Those who have read Page Arnot's previous contributions—"The Miners," which dealt with the history of the Mineworkers' Federation of Great Britain from 1889 to 1910, and "The Miners: Years of Struggle," which continued that story until 1930—will be in no doubt of his fitness to handle the subject of the present book, "The Miners in Crisis and War."

This third volume does not, however, as one might suppose from a first glance at the title, deal with the daring deeds of miners on the field of battle. Its main concern is a continuation of the story of the federation from 1930 to 1944, a period during which the country was faced with serious economic crisis and a terrible world war. The author's trilogy, therefore, now covers the complete life of the Mineworkers' Federation from its birth in 1889 to its dissolution when the National Union of Mineworkers became a reality in 1944.

The main theme of the book is the highly successful, but prolonged, struggle for national unity in the trades union organization of the miners and for the right of their union to discuss with colliery owners on a national as distinct from a district basis all questions of general interest to the industry, including the principles governing wages. At this time of day it may seem strange, and to some even incredible, that either of these two matters should have been the subject of bitter struggle and fierce controversy. Yet such was the case, for some of the autonomous district unions of the miners were just as diehard over the question of one national union as were the district coalowners over the question of national negotiations and agreements.

In a way the book is a lengthy sermon on the text "Unity is Strength." As the 1936 report of the federation's executive put it, the one transparently clear lesson to be learned from the campaign for the "miners' two-bob" was that "only national action can be really effective in raising the standard of our men." Improvement in the power of the federation and its control over the district unions was essential to the attainment of this goal. The author shows how carefully and cleverly this power was slowly achieved by consent of the warring parties.

The "miners' two-bob" campaign was effective in other ways, for it brought the pledge from the Government of the day that the selling organization of the industry would be overhauled and remodelled and it established the National Joint Consultative Council to implement the right of the union to discuss questions on a national basis.

It is worth recalling here a few of the lessons learned by the miners' executive from this campaign. They might well find a place in a textbook for those preparing to enter the field of industrial relations. They were: that truth is the best propaganda; that mere declamation is always a poor substitute for reasoned argument; that both in writing and in speech the language used should be as simple, as pleasing, and as moderate and correct as we can possibly make it; and that to stake claims too high may lead to a reaction against a reasonable compromise in the final settlement. How much simpler industrial life would be if these fine precepts were always practised!

Like the two previous volumes, the present volume is something more than the bald chronicle of the activities of a federation of district unions. It is written with deep perception and much humanity. It deals with men as well as events and, not least, it is a remarkable tribute to the worth and work, to the leadership and organizing capacity, of that grand little miner-statesman, Ebby Edwards, who only recently passed from our midst. Without his wisdom and steadying influence the story told in this book would have been very different.

Despite its absorbing interest, however, the book makes heavy reading, for it contains innumerable quotations from congress resolutions, as well as excerpts from official minutes, many of which are couched in somewhat pretentious language. Impressions gained from a reading of the many pages are the apparently complete and utter lack of imagination, wisdom, and judgment at most times on the part of both colliery owners and Governments, and the rightness of the miners' leaders all along the line. One also senses at times, an underlying assumption that because a demand was granted in full some time after it was first made, it necessarily followed that the demand was wholly justified at the time it was made. Timely concession has always been considered a British tradition, but never at any time, it seems, was this apparently true of the British colliery owners!

While perhaps the book will not convince everyone that it tells the compelling truth about every event covered by it, nevertheless it is a monumental work and an important contribution to industrial and social history. It will certainly let those interested in this subject know what the leaders of the British coalminers were thinking on many important issues during a very critical period in the history of this country. The book should be compulsory reading for all executives in the industry.

Physical Properties of Mine Rock

PROBLEMS encountered and the standardized methods evolved for the determination of a number of the physical properties of mine rock under short-period uniaxial compression are detailed in "Standardized Procedures for the Determination of the Physical Properties of Mine Rock Under Short-period Uniaxial Compression," a technical bulletin (TB 8) by H. R. Hardy, Jnr., of the fuels and mining practice division of the Department of Mines and Technical Surveys, Ottawa.

These properties include compression modulus, Poisson's ratio, ultimate compressive strength, fracture angle, and strain energy. In addition a number of related properties are discussed, including rock type classification, petrographic classification, apparent specific gravity, and Mohs hardness. The analysis of the data obtained for these physical properties is discussed in some detail.

The bulletin runs to 108 pages and includes 38 figures and 12 tables. It may be obtained from the Publication Distribution Office, Mines Branch and Mineral Resources Division, Department of Mines and Technical Survey, Ottawa, Canada, price 50 cents.

IT IS REPORTED that Sindicat Belge d'Entreprises à l'Etranger plans to establish a steel plant in the Province of Necochea, Argentina.

The early stages of flame propagation in a rich methane layer. The flame first spreads rapidly (left to right) from the point of ignition along the inflammable fringe of the layer; all the methane is not consumed in this first flame front, and burning continues for a considerable distance behind the front. The flames from this later burning extend downwards, for a depth several times that of the original methane layer.

MINES RESEARCH IN 1960

Special Attention to Two Hazards

DANGER from coal-dust explosions and the potential hazard of comparatively small accumulations of firedamp are two aspects of coal mining which are continuing to be studied by the Safety in Mines Research Establishment, according to its report for 1960. The explosion at Six Bells Colliery in June, 1960, in which 45 men lost their lives, was a tragic reminder of these two hazards. The dust explosion was initiated by the ignition of firedamp which had accumulated along no more than a few yards of roadway; the dust explosion spread through 3,000 yd. of roadway.

Stone-dust barriers are used in a number of countries to reduce the extent of coal-dust explosions. Although barrier practice in this country follows that of Germany and Poland, British mining conditions differ in various ways from those abroad, and in view of the importance attached to barriers it has become necessary to engage in research appropriate to our own conditions. Plans are now being prepared for a full-scale explosion gallery to be built on the Buxton site; it will permit a major advance in research into arresting coal-dust explosions. The gallery will be 400 yd. long, will have a cross-section of 60 sq. ft., and will be completely instrumented.

Still on the theme of gas and of coal-dust explosions, the report states that studies of layers and accumulations of gas and of the means for detecting them have been extended. Study of the flame lamp has confirmed that it performs well in detecting firedamp in the general body of the mine air, but in thin layers the response of the lamp is less certain and various modifications to improve its performance in this respect are under consideration.

The studies of the flow of methane and its dilution by the ventilating air have produced a satisfactorily complete mathematico-physical account of the phenomena which provides valuable guidance in the choice of preventive and remedial measures. It is possible to calculate in a particular case whether a worthwhile improvement can be obtained by a practicable increase in ventilation velocity or whether it is necessary to reduce the rate of methane emission by methane drainage, if

that is possible, or alternatively to use a combination of both methods. Examination of other remedial measures is in progress.

Research on the ignition of gas by the impact and sliding of rock on rock or of metals on rock continues, but with the emphasis moving towards the latter. Of the 26 methane ignitions reported in 1960, 16 were ascribed to friction, and of these 14 were in the undercut.

Work on mine gases is still directed towards the improvement of means of detection. The development of the SMRE methanometer is nearly complete and the present form of the instrument has received official approval as a firedamp detector and is being manufactured for sale by the Mine Safety Appliances Company, Limited.

Six ignitions were attributed to shotfiring in 1960, a small number compared with the scores of millions of shots fired annually, but ignitions are always serious. The immediate objectives of the work of SMRE on shotfiring are the safety of millisecond-delay firing, and the development of improved methods of testing explosives.

With millisecond delay firing it appears fairly certain that the main danger is that of prior shots opening breaks into which subsequent shots fire, these conditions being very favourable to the ignition of gas. Furthermore, there appears to be little justification for the view that a particular choice of delay time can eliminate this hazard; the real solution appears to be the development of explosives, detonators, and exploders, with which the chance of ignition is negligible. The manufacturers have made steady progress with the safer explosives referred to in the report for 1959, and safe detonators, and an adequate exploder have been developed. A method of assessing the safety of these special explosives has been devised and an approval procedure based thereon is about to be put forward.

Changes under Consideration

In examining improved methods of testing explosives, studies have been made of statistical aspects of present approval procedures together with experimental examinations of the variability inherent in the various methods. It is possible that changes are desirable and these are under consideration.

In studying the fire hazard the SMRE is paying much attention to the spread of fires in the presence of ventilating currents. A fuller knowledge of this subject is a necessary preliminary to work on the use of ventilation as a method of controlling the spread of fires. The experimental facilities for this work are being improved by the provision of a large ventilated duct for the study of model fires.

The development of the SMRE liquid-oxygen breathing equipment is complete. The apparatus supplies cool and reasonably dry air and this should improve the endurance of the wearer in severe stress. Compressed-oxygen systems are being examined since these are felt by the mining industry to have some practical advantages.

The main research objective of work on intrinsic safety is to improve the present too empirical basis for the design of intrinsically safe systems. Work on the safe 12-shot exploder for use with millisecond-delay firing is complete, and the manufacture of the equipment on a commercial scale can be considered. During 1960, the SMRE has investigated scientific aspects of 19 incidents including, notably, the Six Bells explosion.

In the autumn of 1959 the National Coal Board started periodical X-ray examinations of all coal miners, and the aim is to examine each man every five years. Previously this type of examination had been restricted to new entrants to the industry. When the results of this work become available they will give a better picture of the prevalence of pneumoconiosis than do the certification statistics which are the main source of information at present.

Aspects of Mechanical Failure

Design of mechanical components often takes insufficient note of the detailed stress distribution with the result that the component is more prone to failure than it should be, or is inconveniently heavy, or has ill-distributed strength.These aspects have engaged the establishment's attention. One good outcome has been the design of a new roadhead bar that has been completed during the year.

Metallurgical factors are the other main aspect of mechanical failure. The dangerous failure is usually sudden failure and this occurs because a component, initially ductile, becomes brittle as a result of over-stressing or because conditions have led to fatigue damage. In either case metallurgy often provides an explanation and cure: the wrong steel, the wrong heat-treatment, and impurities that bring the temperature of transition from ductile to brittle behaviour into the normal range of ambient temperature, are some of the factors involved. The influence of a variety of such factors is under continuing study.

Export Trade Problems

THREE Cantor Lectures on "Some Problems of British Export Trade" will be given at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2, at 6 p.m. on November 20 and 27 and December 4. The lecturers are Mr. J. L. S. Steel, chairman, Overseas Trade Policy Committee, Federation of British Industries ("Exports and the Country's Economy"), Mr. Reay Geddes, managing director, Dunlop Rubber Company, Limited ("Production for Export"), and Mr. Roger Falk, chairman, Marketing Development Company, Limited ("Oveaseas Marketing").

Applications for tickets should be addressed to the secretary of the society.

STEEL INGOT PRODUCTION of Fabrique de Fer de Charleroi increased to 230,761 tons in the year ended June 30, 1961, from 204,347 tons in the previous year. Output of plates and sheets was 125,086 tons, against 132,874 tons. The new slabbing mill was put into operation in October, 1960.

Obituary

DR. EDWIN GREGORY

Distinguished Sheffield Metallurgist

DEATH occurred at his home in Rotherham on Tuesday of Dr. EDWIN GREGORY, the distinguished metallurgist. He was 67. Dr. Gregory, who was for many years chief metallurgist and a director of Edgar Allen & Company, Limited, Sheffield, was an internationally known authority in his field. His many contributions to technical literature included his first text-book, "Metallurgy," published in 1931 and still a standard work in universities and technical colleges in the UK, the Commonwealth, and the US, and a number of works written in collaboration with Mr. W. W. Stevenson and with Mr. Eric N. Simons.

Dr. Gregory was educated at the old Sheffield Central School and at Sheffield University, where he gained the Associateship in Metallurgy, the Mappin Medal and Premium, and many other awards. The greater part of his career had been spent in the city. After about 12 years with Kayser, Ellison & Company, Limited, he left on account of ill-health in 1920.

DR. E. GREGORY

The following year he joined the permanent staff of the metallurgical department of Sheffield University. At the end of 1937, wishing to return to production work, Dr. Gregory left the university to become metallurgist at the Park Gate Iron & Steel Company, Limited. In 1943 he was appointed head of the metallic materials section of the Aeronautical Inspection Directorate of the Ministry of Aircraft Production with the rank of assistant director.

Work for Technical Bodies

Dr. Gregory joined Edgar Allen & Company as chief metallurgist in 1944, and was made a director two years later. In April this year, when the board of the company was reorganized, he gave up his executive positions, but remained a non-executive consultative director.

Dr. Gregory belonged to many local and national technical bodies and associations. Among much else, he was a member of the council of the Royal Institute of Chemistry, a founder Fellow and vice-president of the Institute of Metallurgists, a governor of the National Foundry College, a past president of the Institution of Engineering Inspection, one of the original members of the British Iron and Steel Research Association Council, and chairman of BISRA Standard Methods of Analysis Committee.

He took an important part in the formation of the British Steel Castings Research Association, and was a member of its council and finance committee as well as research chairman. He had also been president of Sheffield Metallurgical Association, and was a member of the Court of Governors of Sheffield University and of its engineering and metallurgical advisory committee.

In addition to his own published work, he had acted an associate editor of "Kempe's Engineers' Year Book" since 1937, and during his career made many contributions to the discussion of and presented papers before the Iron and Steel Institute.

Managing director of the Airedale Rope Company, Limited, Leeds, Mr. ROBERT HEATON died last Sunday. He was 68.

Mr. HUGH MCIVOR, who has died at the age of 68, was a deputy and oversman at Kinglassie Colliery (Fife), until he retired three years ago.

Chairman of the Grahamston Iron Company, Limited, Falkirk (Stirling), the business started by his father in 1868, Mr. WILLIAM T. MITCHELL has died at the age of 79.

Mr. WILLIAM WALKER, a former manager of the Whiteinch Galvanising Company, Limited, Glasgow, who died recently, was manager of the firm for more than 40 years.

The death has taken place at Middlesbrough, after a short illness, of Mr. ALFRED TOMLINSON, head of A. Tomlinson, Hall & Company, Limited, engineering merchants, of Stockton-on-Tees.

Mr. JOHN RICHMOND, who retired recently from the marketing department of the Scottish Divisional Coal Board, on the grounds of ill health, has died. He was 64 and had spent 49 years in the coal industry.

Mr. DAVID BAIN, who has died in Windsor at the age of 80, was with the Lion Foundry Company, Limited, Kirkintilloch, for 60 years and was the firm's representative for more than 50 years in London. He was appointed a director in 1940.

The death has occured of Mr. WILLIAM S. GRAY, secretary of Sir William Arrol & Company, Limited, structural and mechanical engineers, etc., of Glasgow. He was 62. Mr. Gray joined the company as an accountant in 1948. In 1954 he became assistant secretary, and in 1955 was appointed secretary.

The death occurred on Monday, while walking with a party of geological students on Malham Moor, near Skipton (Yorks), of Mr. LESLIE SMITH, lecturer in mining and mechanical engineering, at Barnsley College of Technology. He was 58. Mr. Smith had been at Barnsley College for 13 years and prior to that he held a similar appointment at Rotherham.

Orders Placed

Vickers to Build Liquid Methane Tanker

ONE of two special tankers required for the Gas Council's scheme to import liquid methane gas from the Sahara is to be built by Vickers-Armstrongs (Shipbuilders), Limited, at Barrow-in-Furness. The vessel will be specially designed for carrying exceptionally low temperature methane, and the contract involves the fabrication of large special quality aluminium tanks capable of operating at these low temperatures and requiring special welding techniques.

Not only is the structure of unusual form, with its associated pipe services which will involve specialized welding on many non-ferrous materials, but the main machinery and auxiliaries will also be different from normal practice. Certain basic investigations into methods of insulation and welding procedures for the aluminium alloy have been carried out by the company as a background to the work.

CONTRACT TO supply the National Coal Board with more than 200,000 ft. of 2½ in. bore plastic fire hose for underground fire prevention purposes, has been awarded to BTR Industries, Limited.

AN ORDER for an automatic line of resistance welding presses has been completed by Steelweld, Limited, Grantham, for the Llanelly (Carms) factory of the British Motor Corporation, Limited.

A SYNTHETIC FIBRE baling press for Courtaulds, Limited, is to be supplied by Fawcett Preston & Company, Limited, Bromborough (Ches), a subsidiary of the Metal Industries, Limited group.

AN ORDER, worth £150,000, from the Yugoslav firm of Valjaonica Dakra Sevojno for slab milling and handling plant to deal with hot rolled copper and brass slabs, has been secured by W. H. A. Robertson & Company, Limited, Bedford.

ORDERED BY THE South Wales Gas Board, the 693 b.h.p., 375 r.p.m. KLSS 3-cylinder diesel, driving a gas compressor, is the hundredth "K" type engine sold for operation on heavy fuel by Mirrlees, Bickerton & Day, Limited, Stockport (Ches).

THE SECOND of two M.E.11 truck cranes made by Thomas Smith & Sons (Rodley), Limited, is being shipped to Burma this week, to meet an order from the Ministry of Defence, placed through Smith's agents, U. Aye & Company, Rangoon.

THREE AXIAL FLOW compressors to supply compressed air for a large tonnage oxygen plant in Poland, have been ordered from Hawker Siddeley Brush Turbines, Limited, by Constructors John Brown, Limited. Delivery of the first compressor set is due in December, 1962.

TWENTY Rotair rotary screw compressor air ends have been supplied by Holman Bros., Limited, Camborne (Cornwall), to Mitsui Seiki K.K., of Tokyo, for installation with Japanese diesel engines into portable compressors. This is the first shipment under an agreement signed with the Japanese company.

CONTRACT worth £23,000 for the supply of an automatic demineralization plant at a new acrylic fibre factory in Yugoslavia has been awarded by Courtaulds, Limited, to the Hertfordshire firm of water treatment engineers, William Boby & Company, Limited. The plant will have a capacity of 7,000 gallons per hour.

CONTRACT TO INSTAL Brightrad radiant strip and unit heaters with fresh air inlets in the Warrington distillery of G. & J. Greenall, Limited, has been obtained by Brightside Heating & Engineering Company, Limited, Sheffield, which has also received an order to instal heating and engineering services in the new refectory block of King's College, Newcastle-upon-Tyne.

CONTRACTS TOTALLING about £12,000,000 have been placed for boiler and turbine plant by the Electricity Commission of New South Wales for the new Munmorah power station. At a cost of £4,000,000 the English Electric Company, Limited, is to supply two 350 mW steam turbines, and International Combustion Australia, an associate of International Combustion, Limited, London, W.C.1, has received an order, valued at £8,000,000, for two 350 mW boiler units, which will be pulverized coal-fired.

ALL THE electrical equipment, valued at £150,000, for two cotton ginning and baling factories for the Sudan Gezira Board is to be supplied by the motor and control gear division of Associated Electrical Industries, Limited. A consortium of companies consisting of Platt Bros. (Sales), Limited, Marples Ridgway & Partners, Limited, and AEI was recently formed and will be responsible for handing over the new factories in full working installations. AEI has received a further order, worth £150,000, through its Australian company for switchgear for the State Electricity Commission of Victoria.

More Facilities Urged for Study of Production Engineering

IN spite of the strides made since the end of the war, Britain was still well behind the other major countries in training sufficient personnel to organize and control industry, said Mr. Harold Burke, president of the Institution of Production Engineers, at the annual dinner of the institution in London on Wednesday of last week. Present day conditions demanded a standard of management requiring the highest order in training techniques, he added, and an intensification of efforts in universities and technical colleges was needed to increase the facilities for study of production engineering and management control.

Guest of honour at the dinner was Viscount Chandos, chairman of Associated Electrical Industries, Limited, who presented the institution's annual awards. Other guests included Mr. H. A. R. Binney, director, British Standards Institution; Sir Harold Roxbee Cox, president, National Council for Technological Awards; Mr. John Marsh, director, British Institute of Management; Sir Charles Norris, director, British Productivity Council; and Mr. S. Steward, director, British Electrical and Allied Manufacturers' Association.

BRITISH-EAST GERMAN TRADE INCREASE

FIGURES published by the Board of Trade show that British-East German trade (including re-exports) for the first nine months of 1961 totalled £12,783,486, more than £1,500,000 above the figure for the same period of 1960 and more than £6,500,000 above that for 1959.

British exports to East Germany for the period totalled £5,932,508, compared with £5,533,682 in 1960 and £2,155,039 in 1959. Re-exports totalled £1,598,776, compared with £855,801 in 1960 and £572,344 in 1959. Imports into Britain from East Germany totalled £5,252,202 compared with £4,694,138 in 1960 and £3,423,611 in 1959.

"Profitable Investment"

ACCOUNTANT'S CONFIDENT VIEW OF NCB

PROFITABLE investment for the taxpayer which has not cost him a penny, was how Mr. R. P. Lawrence, chief accountant, South-Western Divisional Coal Board, described the NCB at Bridgend, on Thursday of last week. He was speaking at a meeting of the Mid-Glamorgan Mining Society. Unlike limited liability companies which paid dividends on shares only if there was a surplus over expenditure, he said, the board was obliged to meet its interest charges on capital whether profits were made or not.

"In 1960 we paid nearly £42,000,000 in interest charges. This was about £5,000,000 more than in 1959, and the charge for 1961 could be over £45,000,000. This amount will have to be found because it represents money which the Government needs to pay interest on Government stocks issued to meet the loan requirements of the board," he continued.

"This interest must come from the revenues of the board. The position is as simple as that. When people talk vaguely about taxpayers financing the board nothing could be further from the truth."

Coal's Dominant Position

Mr. Lawrence pointed out that the mining industry was still providing 75 per cent. of the total energy requirements of the country, and the growth of these requirements meant that coal would retain a significant place in the country's economy for many decades.

This was the dominant position held by coal in Britain's economy, and although only 1.6 per cent of the country's investment in capital goods was placed in the coal industry, the income of the employees of the board was 2 per cent. of the national income.

At the end of 1960 the balance sheet showed assets exceeding £1,000,000,000 with capital borrowing at £974,000,000. The cumulative deficit by that time amounted to £78,000,000 on revenue account. There were unrealized appreciations in stock values amounting to £10,000,000 and a reserve fund of £4,000,000 to meet this deficit in part.

In the years from vesting date until the end of 1960, the board made a profit of £247,000,000 from deep mine collieries; £41,000,000 from open-cast workings; and £32,000,000 from ancillary activities, a total profit of £320,000,000. Interest payments to the Minister absorbed £300,000,000, other interest payments £14,000,000, taxation took £10,000,000, and the loss on imported coal was £74,000,000. The last figure, approximately equivalent to the accumulated revenue deficit, had the effect of being a subvention by the National Coal Board to British industry at large.

Mr. Lawrence stated that 72 per cent. of the net new expenditure on capital assets in 1960 came from internal resources. This meant that in 1960 the board almost reached the level of financing its own capital expenditure.

ACTUAL PRODUCTION of raw steel in the US during the week ended November 6 totalled 2,044,000 net tons. This was a 0.6 per cent. decrease compared with the 2,057,000 tons produced in the preceding week. Actual raw steel production in the US in the current year to date totalled 80,765,000 tons—a 7.7 per cent. decrease compared with the corresponding period last year.

Success of Reconstruction in Durham Coalfield

A GREAT programme of reconstruction of the coal-mining industry in the North-east had been undertaken to provide efficient productive capacity in larger units possessing adequate reserves, said Dr. William Reid, chairman of the Durham Divisional Coal Board, in his presidential address to the Newcastle-upon-Tyne Fuel Luncheon Club. The fruits of this programme, associated with increasing mechanization, were emerging in higher output per manshift and a greater bulk tonnage per colliery unit, and recently overall productivity in the division reached a record level for the coalfield.

The chairman said that large reserves of coal existed in the division, particularly on the eastern side of the North-east coalfield. The boring tower operating off the Durham coast had been very successful in proving reserves in the order of 300,000,000 tons. One of these seams, thicker than expected, and which would yield coal suitable for power stations, would be worked from Westoe Colliery. Unfortunately, it would be necessary to close several small collieries because of exhaustion of realistic reserves.

Dr. Reid said the question was often asked: How will coal, oil, natural gas, and nuclear power share Britain's future energy requirements? Fuel requirements, he believed, would increase far beyond the present national level, and if the productivity of the coal industry could rise year by year with better machines, more efficient and safer techniques, then coal would remain the nation's basic fuel.

Progress was being made. Overall productivity in the Durham Division was 20.3 cwt. in 1957. This year to date the average was 23 cwt. "By 1966, with a growing percentage from reconstructed collieries and a further increase in mechanization, we should reach 26.5 cwt. That is the absolute minimum if Durham coal is to be competitive."

Inquiry into Coal Tip Excavation

NEARLY 100,000 tons of usable coal for power stations could be gained from a tip near Dronfield, Sheffield, it was stated by Smith Kearns & Company, Limited, of Ecklington, at a public inquiry against the veto of the Derbyshire planning authority on the firm's proposal to excavate the tip, which was made up of waste coal from Unstone and Summerley collieries.

Objection of the planning authority was that access from the site to the main Sheffield-Chesterfield road constituted a traffic hazard and that the amenity of the district would be spoiled.

Distington Continuous Casting Plant for TI

FOLLOWING inspection of existing continuous casting plants in England and on the Continent, Tube Investments, Limited, London, has decided to instal a Concast continuous casting machine at its Round Oak Steel Works, Brierley Hill (Staffs). The machine will be the pilot plant for experimental and research work for special products for the whole TI group. It is to be built and erected by Distington Engineering Company, Limited, Workington, a branch of the United Steel Companies, Limited, and associates of Concast, AG, Zurich, in the field of continuous casting.

The Round Oak plant will be a single-strand unit designed to cast killed carbon steels into 2 in. to 6 in. sections. Liquid steel produced in an electric arc furnace will be poured from a 5-ton ladle on to a tundish feeding direct into a water-cooled copper mould. After leaving the spray cooling chamber and withdrawal rolls, the solidified billet will be cut during its descent and then discharged vertically on to a tilting table, which will tilt the billet on to a horizontal roller path.

Concast continuous casting machines are at present being built by Distington for Appleby-Frodingham Steel Company, Scunthorpe, Richard Thomas & Baldwins, Limited, Panteg, Shelton Iron & Steel, Limited, Stoke-on-Trent, Canara Workshops, Limited, Mangalore, India, and K-M Steel Products, Limited, Richmond, New South Wales, Australia.

New European Service for British Businessmen

BRITISH businessmen planning to extend their activities on the Continent can now receive comprehensive assistance on a pan-European basis, designed to cover all the main problems confronting them. A new service, available in all western European countries and operated from centres in France, Germany, Italy, Switzerland, and Scandinavia, has been introduced by Personnel Administration, Limited, management consultants.

It will cover such matters as the statistical analysis of European markets by volume and location; detailed surveys of market trends and potential for specific products and industries; the feasibility of establishing manufacturing units in a particular country, with reference to labour availability, wage rates, the most appropriate locations, eligibility for government aid, etc., and the most suitable distribution and marketing arrangements.

Export Plan for Australian Steel

AUSTRALIAN Government proposals for increasing steel production sufficiently to build up an annual export trade of 1,000,000 tons, worth £A50,000,000 within five years, have been discussed with the Broken Hill Proprietary Company, Limited.

Present production is about 4,000,000 tons, but as home demand over the next five years will involve a rise to 5,000,000 tons, the Government proposals would mean a 6,000,000 tons target by 1966.

DUNFORD & ELLIOTT (SHEFFIELD), LIMITED—Mr. Maurice Wright has been appointed a director.

Industrial Injuries Benefits Improved

INCREASES in compensation supplements to some 20,000 disabled workers who had accidents or contracted diseases before 1948—and therefore cannot qualify under the Industrial Injuries Act—are provided for in the various improvements in National Insurance and Industrial Injuries benefits included in the Family Allowances and National Insurance Bill published last week. These increases range from 7s. 6d. to 15s. a week and will cost the Industrial Injuries Fund a total of £550,000 in the first full year.

The scope of the industrial injuries scheme is also to be widened to include accidents during work resulting from "common risks" which are not at present covered by the scheme. In addition, the circumstances in which lost promotion prospects can be taken into account in determining an injured person's entitlement to special hardship allowance, will be extended. The amount that men receiving unemployment supplements under the industrial injuries scheme may earn a year without affecting their supplements is to be raised from £52 to £104.

Thos. W. Ward Prospects Depend on Steel Output

IN future months the level of steel production is the factor most likely to have an influence on the profits of Thos. W. Ward, Limited, engineers and machinery manufacturers and merchants, of Sheffield, says Mr. H. W. Secker, the chairman, but at the present moment, he adds, there is no sign of an improvement in the outlook for that industry. Those sections of the group engaged in the supply and manufacture of engineering products can expect to maintain profits at a satisfactory level for the next 12 months.

The decline in steel production has resulted in a reduced demand for scrap from the firm's yards and also from shipbuilding. When demand slackens, however, experience proves that competition is less severe and there is a tendency for profit margins to improve. So far during the current year scrap tonnage delivered to the steelworks is down, but Mr. Secker points out that a recovery of steel production could quickly improve the present position, though the reverse would have a serious effect on profits. As regards rolling mill interests, results will be largely dependent on the level of activity in the motor industry.

£3,000,000 *Ship Orders Taken at a Loss*

ONE of the most successful small shipyards on the Clyde this year, Simons-Lobnitz, Limited, Renfrew, stated recently that the £3,000,000 worth of orders it had secured in the past five months had been taken at a loss. A spokesman for the company, which is a member of the G. & J. Weir, Limited, group, said the policy was a short-term one. "More would be lost if we did not keep our skilled labour force intact and our yard going in work."

To cope with its growing order-book, now standing at 14 ships, the firm has increased its labour force in the past two months from 1,200 to 1,400. Of the five orders for 11 ships secured since June, three, involving eight vessels, are for oversea owners.

IRON AND STEEL TRADE

NO substantial improvement can be expected in the next two or three months, during which time the stock fall should reach a point when both main consumers and merchants will begin to step up specifications for the delivery of fresh supplies. There will be the normal fluctuations, but they are not likely to affect the broad outline which is one of short-time working at the blast furnaces, melting shops, and rolling mills. The one exception is the continuing healthy demand for universal beams, production of which calls for 17 shifts a week, compared with the 12 or 13 being worked by most other sections of the finishing trade.

Pig-iron

There is very little sign of demand matching production of pig-iron, restricted though output is, and most makers have tonnages to spare. Outputs of basic pig-iron have been scaled down severely and although some furnaces have been closed down and those burdened for this iron are working at well below capacity, there is still more available than is required.

The foundry grades of pig-iron are equally plentiful with the low phosphorus irons most on call. There is little forward buying or stock building in any of the grades.

Ferro-alloys

The price of ferro-tungsten has been reduced to 9s. 6d. per lb. W. contained. Tungsten metal powder is also reduced to 12s. 6d. per lb. It was unusual to record more interest in ferro-tungsten in spite of the price reductions. Both the low- and high-carbon grades of ferro-chrome are in moderate demand, and support for ferro-silicon is good.

Reasonable attention is being given to both ferro-titanium and ferro-niobium, while ferro-vanadium and ferro-molybdenum are in fair request.

Semi-finished Steel

Demand for reinforcing rods is maintained at a reasonable level, but there is little or no change in the trading position generally at the re-rollers. Output of small bars, light sections, etc., could be considerably increased without difficulty.

Because of the falling off in consumption of steel semis, orders placed with home steelworks are few and far between. The supply of carbon and alloy steels is now much easier.

Finished Steel

Consumers are able to obtain most of their needs from current rollings so that there is little forward placing of orders for sections. There is a steady call for galvanized sheets, special alloy, and high carbon steels, etc., but the level of demand is below capacity.

Orders for structural steelwork are keenly competed for, with the result that both prices and delivery dates are reduced to the keenest margin possible in order to secure the business, whether for small or large contracts.

TO ENABLE them to give an even wider and better customer service and to broaden their research and marketing potential throughout the world, the Electric Construction Company, Limited, manufacturing electrical engineers, of Wolverhampton (Staffs), the Reliance Electric & Engineering Company, of Cleveland, Ohio, and Schindler-Reliance Electronics Inc. of Dierikon/Lucerne, Switzerland, are co-ordinating their engineering and marketing interests in the industrial electronics, engineered drives and associated fields.

Iron-ore Imports

IMPORTS of iron ore and concentrates (except chrome iron ore) and roasted iron pyrites in September, and the totals for the first nine months of this year and last, are shown in the table below.

From	Month ended Sept. 30.	Nine months ended September 30.	
	1961.	1960.	1961.
	Tons.	Tons.	Tons.
Sierra Leone	28,180	565,744	414,552
Canada	296,437	2 506,406	1,865,828
Other Commonwealth countries and Eire	1,610	23,727	8,776
Sweden	331,050	3,590,218	3,703,194
Norway	14,200	249,839	231,320
France	44,040	433,860	368,197
Portugal	9,139	289,516	126,737
Spain	45,053	553,074	533,964
Algeria	143,320	1,554,523	1,173,848
Tunisia	27,830	564,907	348,218
Morocco (including Tangier) ..	41,480	603,675	417,778
Liberia	61,630	404,542	389,270
Venezuela	118,645	1,216,965	1,417,717
Brazil	11,400	450,343	450,339
Other foreign countries	72,369	562,218	485,640
TOTAL	1,246,383	13,569,557	11,935,378

THREAT OF RISING US STEEL IMPORTS

FEARS have been expressed in the US that if the present rate of steel imports is maintained many steel expansion plans may be deferred or cancelled. Imports in August, at 307,000 tons, reached their highest monthly total since April, 1960, according to figures published recently by the Commerce Department. Over the first eight months steel imports amounted to 1,900,000 tons. For 1961 as a whole they are expected to be not far short of last year's total of 3,300,000 tons when the figures were swollen by orders placed during the 1939 steel strike.

Exports from the US continue to decline and were only 150,000 tons in August. Total exports for 1961 are expected to be about 1,800,000 tons, which apart from 1959 would be the lowest since 1938.

MANUFACTURERS of materials handling plant and nuclear fuel charging equipment, Strachan & Henshaw, Limited, Bristol, have moved its headquarters to a new office building adjoining the company's Ashton works, in Ashton Vale Road, Bristol, 3. The company's works at St. Philips, Bristol, which previously included the main office, will continue as a production unit.

Coalfield News

West Midlands NCB Productivity Peak

ANOTHER coal productivity peak has been reached—this time by the West Midlands Division of the NCB which achieved 101.8 cwt. per manshift in the week ended October 27—more than half a hundredweight higher than in the previous week. Productivity overall also rose slightly to 31.9 cwt.

Baggeridge Colliery (South Staffs) also achieved a record coal-face OMS for the second week running with 112.6 cwt., an increase of nearly 3 cwt.

SINCE 1944 training officer at Barnsley Main Colliery Mr. Elias Curtis has retired after 52 years at the colliery.

A FILM MADE while Barrow Colliery, Barnsley, miners were recently raising productivity figures to a record OMS of 22.53 tons, was shown at a celebration dinner organized last weekend by the men.

NO DECISION on Saturday shift working was reached by the Yorkshire Area council of the National Association of Colliery Overmen, Deputies, and Shotfirers, at its meeting at Barnsley on Saturday.

A SLAG HEAP is to be built at Prestwick Airport. A mound, 30-ft. high of pit waste will prevent distortion of the glide path beam from neighbouring interference. The mound will be covered with grass.

TO HANDLE statistics and accounting for the East Midlands Division of the National Coal Board, three computors are soon to be installed at Mansfield (Notts). The project will be one of several set up by the board.

DELEGATE FOR the Bowers, Castleford, branch of the National Union of Mineworkers, Mr. Jack Leigh has been elected vice-president of the Yorkshire Area. His unsuccessful opponent was Mr. Jock Kane, delegate for the Armthorpe branch.

DRIVING 21 coal trucks at St. John's Colliery, Maesteg (Glam) on Monday, Mr. J. O'Flynn jumped clear and was uninjured when his train collided with eight other loaded trucks. Fourteen trucks were damaged when they went into a siding at about 40 m.p.h.

EMERGENCY RESOLUTION regarding the future of the coal mining industry was passed by Fife County Council last week. The council was concerned at the inferences to be drawn from the Minister of Power's statement on the annual report of the National Coal Board, particularly his reference to the economy of the Scottish Division.

ALTHOUGH HE never earned more than £8 a week, Mr. Joseph William Laughton (84), a retired collier, who worked on the surface at Brodsworth Colliery, near Doncaster, for many years, has left a third (£1,330), of his £3,992 will to the British Limbless Ex-Servicemen's Association home at Blackpool. He was a veteran of the First World War and lost a leg.

AT ITS COUNCIL meeting at Barnsley (Yorks), on Tuesday of last week, the Yorkshire Area of the National Union of Mineworkers decided to accept the invitation of Dewsbury Corporation to hold next year's Yorkshire Miners' Demonstration at Dewsbury as part of the borough's centenary celebrations. The miners last held their demonstration at Dewsbury in 1903.

SPONSORED BY the northern division of the Coal Industry Social Welfare Organization, an exhibition of paintings, drawings and sculpture by artists in the coal industry opened on Monday at Gosforth (Cumberland). Prizewinners include an 85-year-old retired colliery joiner, a colliery manager, mineworkers, apprentices, and wives and children of those employed in the industry.

MORE THAN 75,000 miners in the Midlands will be asked to pay an extra 2d. a week to the Midland District Miners' Fatal Accident Relief Society, if a scheme adopted by the society's delegate meeting at Derby last Saturday is agreed by the individual branches. Members would pay 4d. a week instead of 2d. which has been the rule since 1952. The money will be used to increase benefits.

A NEW CAR will become the property of some fortunate Durham coalfield worker early next year, as a reward for being safety-conscious. A Ford Anglia *de luxe* is the special prize offered by the Durham Divisional Coal Board to stimulate even more interest in its successful Greater Safety Campagn. Those who qualify to enter the draw for the car will be the quarterly main prizewinners who remain accident-free during the year.

Scottish Coal Prices and Power Generation

IF there are increases in the price of Scottish coal, the case for hydro-electric generation will become stronger and the whole question of thermal generation in Scotland will have to be revised, including the possibility of generating in an area of Britain where coal is cheaper. This was stated last week by Mr. P. M. Thomas, managing director of William Beardmore & Company, Limited, steel manufacturers, of Glasgow, and chairman of the Scottish council of the Federation of British Industries. The council has submitted evidence containing this view to the Mackenzie Committee, the Departmental committee on electricity in Scotland.

Mr. Thomas said that despite assurances by the National Coal Board that prices would remain reasonably stable for a long period ahead, Scottish power stations were using Scottish coal on which the board was incurring substantial annual losses and even then prices of Scottish coal were about 3 per cent. higher than that mined in Yorkshire and the Midlands. If for any reason the price went up because of the present losses this would be bound to have an adverse effect on electricity prices in Scotland.

Derbyshire Miners' Gesture

SOME 34,000 miners in Derbyshire are to give up part of their concessionary coal allowance to help retired pit workers and miners' widows. Each man will give 8 cwt. a year to prevent the county's coal pool scheme for dependants from showing a deficiency in reserves. If nothing had been done the pool would probably have been 9,000 tons short by next year due to a decline in manpower and an increase in the number of men being compulsorily retired.

Despite the miners' gesture, dependants will still have to take a cut in their coal allowance. Retired workers will get 1 ton less a year, while some widows will lose 2 tons.

WILLIAM HAMILTON & COMPANY, LIMITED—Mr. W. B. Halliday has retired as secretary but continues as a director.

THE COAL TRADE

WINTER prices, which commenced on November 1, have had their usual dampening effect on consumers' inquiries for house coal, and order offices are more occupied with answering queries on deliveries that have not arrived than with taking fresh orders. There is little doubt that householders in many areas have stocked up better this summer than for some years past, but a spell of colder weather should put an end to the present lull. The small anthracite outlook remains depressing and increasing demands for premium smokeless fuels cause merchants some anxiety. Durham's sale of 50,000 tons of top-grade coking coal to Czechoslovakia has given a fillip to the export trade, but foreign sales generally are up against severe price competition, particularly from Poland.

SOUTH-WEST LANCASHIRE

The heavy rush of orders for house coal experienced towards the end of October has died away, owing to the winter price increase and merchants report a very marked fall in demand, with no difficulty experienced in meeting all orders promptly. As is usual, an improvement in supplies has taken place simultaneously with the fall in demand and merchants have been obliged to put further supplies into stock in order to save demurrage charges. This setback in demand is probably of a temporary nature, but when normal winter demand will set in depends very much on the weather. As it appears that rather more householders than usual stocked up during the summer this year, the full weight of winter demand may not be felt for some time.

There is a steadily increasing request for smokeless household fuels, and deliveries of Coalite and Rexco in particular are not at present keeping pace with full demands, although the delays are not serious so far. No improvement can be reported in the anthracite nuts position, which remains one of great difficulty, in face of a steadily increasing demand.

In common with the house coal market, gas coke requirements have also declined, as many large industrial undertakings stocked quite heavily during October, but a steady improvement in demand for coke should become apparent as wintry weather approaches. Industrial demand for both hard and gas coke, and particularly graded sized qualities, remains very satisfactory. Other industrial fuels continue to be in good supply and are sufficient to meet full allocated tonnages.

Demands for fuels for ship-repairing yards shows a slight increase and supplies are satisfactory. Coastwise trading continues steadily.

DURHAM COKING COAL FOR CZECHOSLOVAKIA

ABOUT 50,000 tons of top-quality Durham coking coal is to be exported from the Tyne during the next few weeks to Czechslovakia. The first shipment of 1,300 tons left the river on Tuesday in the Polish steamer Ustka for Stettin, in Poland. All the coal will be shipped through Baltic ports. It is thought to be the first Durham coal to go to a Communist country since the war.

The contract was arranged in London, and the shipments are being arranged by Anthony & Bainbridge, Limited, coal exporters, of Newcastle. The deal will boost the Tyne's coal exports, which are already running well ahead of the 1960 rate. In the 10 months to October, 411,888 tons have been shipped to foreign ports—an increase of 107,478 tons on the same period last year.

Coal Output Back to 4,000,000 Tons

NOT since the week ended May 13 has total output of saleable coal topped the 4,000,000-ton mark. Manpower was then 574,660 overall and 215,040 at the face, and productivity at 29.10 cwt. overall and 83.56 cwt. at the face. Last week output reached 4,006,000 tons; manpower is down to 561,850 overall and 210,080 at the face, and OMS has risen to the record figure of 30.20 cwt. overall and 86.64 cwt. at the face.

There is little change in stocks, either at the pithead or held by consumers. Undistributed stocks are now over 10,000,000 tons below last year's figures and consumers' stocks at 18,123,000 tons (including 380,000 reserve stock held for the domestic market), are 3,300,000 tons up on last year.

There were 561,850 wage-earners on colliery books on October 28, against 586,040 on October 29, 1960, the numbers engaged at the coal face being 210,080 and 221,450 respectively. Total absenteeism (all workers) in the week ended October 28 was 15.43 per cent., compared with 14.79 per cent. in the week ended October 29, 1960. Output at the face was 4.332 tons and overall 1.510 tons in the week ended October 28, compared with 4.058 and 1.428 tons in the week ended October 29, 1960.

The following table gives (in tons) the provisional figures of output of saleable mined coal by division in the week ended November 4, and the tonnage lost through disputes:—

Division.	Week ended November 4, 1961.		Week ended November 5, 1960.
	Total output.	Tonnage lost.	Total output.
Scottish	355,000	6,000	350,000
Northern (N&C) ..	245,000	—	247,000
Durham	456,000	5,000	457,000
North-Eastern ..	836,000	12,000	826,000
North-Western ..	251,000	2,000	241,000
East Midlands ..	948,000	2,000	889,000
West Midlands ..	296,000	—	278,000
South-Western ..	366,000	5,000	379,000
South-Eastern ..	31,000	—	31,000
Great Britain—			
Deep-mined coal ..	3,784,000	32,000	3,698,000
Open-cast coal ..	177,000	—	113,000
Other deep-mined (including licensed mines) ..	45,000	—	39,000
TOTAL	4,006,000	32,000	3,850,000

Company News

Neepsend Steel Forecasts Another 50 per Cent.

WHILE under the pressure of disturbing events, national and international, the directors of the Neepsend Steel & Tool Corporation, Limited, Sheffield, say they cannot ensure record figures year after year, they are hopeful they will be able to present a satisfactory profit position next year and to repeat the present 50 per cent.

Full working production was maintained in the year ended March 31, 1961, but Sir Stuart Goodwin, the president, says there is now a slight falling off in the activities of some of the smaller companies, though this is not expected to have any serious effect. Export trade improved considerably last year and every effort is being taken to develop more, though the expense in getting such business is heavy and the prices the company has to quote to secure orders are extremely keen with a consequent decline in profit margins.

COCHRAN & COMPANY, ANNAN, LIMITED, boilermakers and engineers, of Annan (Dumfries)—Net profit for the year ended June 30, 1961, is £82,724 (£72,283), after tax of £68,932 (£72,283) and, with an unchanged final of 6 per cent., total distribution for the year is 8 per cent.

FRY'S (LONDON), LIMITED, tool manufacturers and wholesalers, of London, S.E.10—Group net profits for the year ended July 31, 1961, are less at £29,950 (£40,281), after tax of £24,350 (£33,157) and the dividend is cut to 17½ (20) per cent., with an unchanged final of 10 per cent.

SIMON ENGINEERING, LIMITED—Interim dividend of 10 per cent. less tax has been declared on the 5s. ordinary shares for the year ending December 31, 1961. Interim on the 6 per cent. £1 cumulative preference shares is declared at 6 per cent. per annum less tax in respect of the half year ending December 31, 1961.

ROBERT HUDSON, LIMITED, manufacturers of light railway equipment, iron and steel founders, etc., of Leeds—Group profit is down to £201,985 (£312,302) with a parent company loss of £68,709 (£56,626 profit). Net profit contracted to £92,985 (£167,802) after tax of £109,000 (£144,500) and the dividend is reduced to 12½ (15) per cent. with a final dividend of 5½ per cent.

STANDARD RANGE & FOUNDRY COMPANY, LIMITED, tool and hardware stockholders, of Watford (Herts)—An extra-ordinary meeting will be held on November 21, 1961, to consider an increase in the authorized ordinary capital to £350,000 by the creation of a further 400,000 ordinary shares of 5s. each and capitalization of £100,000 from reserves to make a free scrip issue.

HELICAL BAR & ENGINEERING COMPANY, LIMITED—Declaring an interim dividend of 6d. per 5s. ordinary share, or 10 per cent., the directors consider that not less than 6d. a share will be recommended as a final. The interim, on capital increased by a two-for-five scrip issue, compares with the previous equivalent of 7.14 per cent. For the year ended January 31, 1961, holders received total dividends equal to 22.14 per cent.

WALLIS TIN STAMPING COMPANY, LIMITED—Improvement in sales has been maintained in the current year, and although labour and raw material costs are rising the directors are hopeful that increased sales and improved production methods will enable the past year's increased profits to be maintained during the current year. After taxation of £37,372 and depreciation charges there was a net profit of £69,123 for the year ended June 30, 1961—an increase of £22,135.

SPENCER (MELKSHAM), LIMITED, manufacturers of elevating, conveying, and conditioning plant, of Melksham (Wilts)—Net profit for the year ended September 26, 1961, increased to £147,340 (£125,428), after tax of £143,280 (£129,730). Dividend is maintained at 15 per cent. and a 50 per cent. scrip issue is proposed. Holders registered on November 17 will be allotted one new 5s. ordinary share for each 10s. held. The existing shares will then be subdivided into 5s. shares.

RANSOMES & MARLES BEARING COMPANY, LIMITED, Newark (Notts)—The order-book has shown a slight increase over the year and present sales are up to last year's corresponding period, says the chairman, Mr. E. W. Senior. While demand from the capital goods industries remains high, it is doubtful if the full effect of the "Little Budget" has yet been felt on consumer durables and whether the trend will be similar to that of last year, when the company was adversely affected by the recession in the motor industry.

STEEL BARREL, SCAMMELLS & ASSOCIATED ENGINEERS, LIMITED—Group net profit rose from £77,728 to £81,313, after tax of £86,896 (£64,089), in the year ended June 30, 1961, and the company is raising its distribution by 10 per cent. on the occasion of its jubilee year with a maintained dividend of 20 per cent. plus a bonus of 25 per cent. A one-for-two scrip issue is also proposed. At the annual meeting on November 30, an increase in the authorized capital to £400,000 will be proposed.

PENARTH PONTOON, SLIPWAY & SHIP REPAIRING COMPANY, LIMITED—The name of the company has been changed to Penarth Dock Engineering Company, Limited, to keep its identity in line with its engineering work. The firm gave up shiprepairing earlier this year. The subsidiary company, Penarth Pontoon & Hodges (Barry), Limited, has adopted the new name of Hodges (Barry) Engineering Company, Limited. There is no change in the name of the other subsidiary, Fownes Forge & Engineering Company (1928), Limited.

£662,000 Take-over Bid for Follsain

VEHICLE equipment manufacturers of Lincoln, Clayton Dewandre Company, Limited, has made an offer to acquire all the issued share capital of Follsain, Limited, manufacturers of special alloys and steel castings, of Lutterworth, near Rugby (Warwicks). For every five Follsain 4s. ordinary shares, holders will be offered one Clayton Dewandre £1 ordinary unit, these terms valuing the Follsain shares at 10s. each against a market price of 9s. and a price of 50s. for Clayton Dewandre. The equity share capital of Follsain is thus given a total value of £662,000.

Included in the terms is an exchange of 40 Follsain 6 per cent. 10s. preference for 21 Clayton Dewandre 6 per cent. £1 preference shares. The board of Follsain recommends the offer and they intend to accept in respect of their own holdings totalling more than 26 per cent. of the ordinary. Mr. H. M. Jones, chairman of Follsain is to be invited to join the board of Clayton Dewandre on the offer becoming unconditional.

Ironfounders' Report

ENTRY INTO COMMON MARKET FAVOURED

WHILE favouring the entry of Britain into the Common Market, the Joint Iron Council in its report for 1960-61 warns that the balance of advantage is fine and competition from European foundries cannot be regarded as a matter of academic interest. As tariff walls crumble, an efficient continental foundry has an opportunity to launch its sales efforts in the UK, but Britain can compete successfully—as it has done for many centuries without special trade privileges—if solutions can be found to the problems of inflationary increases in basic costs.

The report points out that from the point of view of general basic costs such as labour and raw materials, the industry in the UK is competitive with its European counterparts while in general the UK retains its lead in productivity. Disturbing aspects are the rate of advance in many of the countries belonging to the ECSC and their relative stability of costs.

"We are still the leading ironfounders in Europe but there can be no doubt that a new challenge faces us," the report states. Everything depended now upon the UK putting its own house in order, achieving a new dynamic force of industrial progress and thus becoming a respected leader as well as counsellor in Europe.

No Substitute for Iron

Exports were also the theme of the two principal speakers at the council's annual banquet in London on Wednesday. The High Commissioner for Canada, Mr. George Drew, acknowledged the debt the Commonwealth and the world owed to British ironfounders of the past and stressed the growing importance of Canada in supplying the industry's vital raw materials —"the one product for which there can be no substitute." There were vast opportunities for considerably increased trade between Canada and the UK and the chance of strengthening an invaluable partnership.

Sir William McFadzean, chairman and managing director of British Insulated Callender's Cables, Limited, and chairman of the Export Council for Europe, dispelled the impression that he favoured Europe to the exclusion of the Commonwealth—both were vital to this country. There was, however, an enormous potential in Europe and he was convinced that, whatever happened, Britain was going to have to fight harder and harder not only to increase her exports but to retain her own home market. "We have got to attack these European markets—we must go in and fight if we want to stay in," he said.

Mr. Drew in his speech proposed the toast of the Iron Industry, the response to which was given by Mr. N. P. Newman, president of the Joint Iron Council. Sir William McFadzean was responding for the guests who were welcomed by Mr. M. M. Hallett, vice-chairman of the Council of Ironfoundry Associations.

Mr. P. H. MORWOOD has been appointed secretary of the English Steel Corporation, Limited, in succession to Mr. A. M. Simmers who has taken a post with Vickers, Limited. Mr. A. TAYLOR, special director, has been appointed chief accountant of the Corporation.

Australian Iron and Steel Production

PRODUCTION of steel ingots by the Broken Hill Proprietary Company, Limited, and the Australian Iron & Steel Pty., Limited, in September reached 335,031 tons, while that of pig-iron was 266,955 tons. Output by the various mills was as follows:—Bloom and slab mills, 289,149 tons; heavy and continuous mills, 177,653 tons; plate and strip mills, 84,480 tons; merchant mills, 95,523 tons; rod mill, 12,323 tons; cold rolling mills, 1,713 tons.

Output of tinplate was 7,663 tons and that of spun pipes 5,251 tons, while production by the steel foundry (excluding ingots) was 981 tons and by the iron foundries 9,029 tons. Output of coke reached 206,626 tons. Raw materials shipped were:—Ironstone (Whyalla and Cockatoo Island), 428,386 tons; limestone (Rapid Bay), 37,981 tons; dolomite (Ardrossan) 17,051 tons.

French State Plan Provides for More Steel

ONE of the aims of the State Plan for 1962-65, which M. Pierre Masse, the French Planning Commissioner, submitted to the Higher Planning Council recently is that production of steel will rise from 17,200,000 tons to 24,500,000 tons, thanks partly to the completion of two new rolling mills at Dunkirk and in Lorraine.

Studies will be made for another sea-based steelworks, possibly at Marseilles, where port traffic has declined with the passing of the French Empire. More concentration and specialization is recommended to manufacturing industry, which is becoming increasingly subject to Government influence.

Priority is to be given to the capital goods and food processing sectors, and some kind of co-ordination of investment programmes is suggested for cars, textiles, shipbuilding, and aircraft.

BY AN OVERWHELMING majority of 70,000 votes, South Wales miners have rejected the National Coal Board's request for a resumption of Saturday working in selected pits.

SINCE one underground worker was sent home by the management on Thursday of last week at the new £10,000,000 Abernant Colliery, near Pontardawe (Glam), there was a strike every day up until Wednesday. Most of the men who struck were day-shift men who came out in sympathy with men sent home for "not working diligently." An NCB official said it was hoped to resolve the trouble.

Board Changes

Solicitor Joins Pollard Ball Bearing

DIRECTOR of a number of companies, including Graham Firth Steel Products, Limited, and Metal Mouldings, Limited, which are members of the Brightside Engineering Holdings, Limited, group, Col. Alan Randall Rees-Reynolds has been elected to the board of POLLARD BALL & ROLLER BEARING COMPANY, LIMITED.

A solicitor and partner in the London firm of solicitors, Joynson-Hicks & Company, he is also a director of Blundell-Permoglaze, Limited, Coated Strip, Limited, and property companies and investment trusts. He was recently appointed Under Sheriff of the County of Surrey.

HEPWORTH & GRANDAGE (YEADON), LIMITED—Mr. Allan Rowntree, general manager, has been appointed to the board.

STEEL COMPANY OF WALES, LIMITED—Lord Cobbold, who retired as Governor of the Bank of England in June, has been appointed to the board.

KELVIN & HUGHES, LIMITED—Mr. W. Halliday, chief scientist of the company, which is a division of S. Smith & Sons (England), Limited, has been appointed a director.

TEXTILE MACHINERY MAKERS, LIMITED—Mr. Ralph Chiles, chairman of Prince-Smith & Stells, Limited, has joined the board. Both companies are members of the Stone-Platt Industries, Limited, group.

COALITE & CHEMICAL PRODUCTS, LIMITED—Mr. F. L. Waring, managing director, has been elected deputy chairman of the group. He is vice-chairman of the Chemical and Allied Industries Joint Industrial Council.

JAMES WILKINSON & SON, LIMITED—Mr. T. E. Peacock and Mr. A. C. Nicholson, joint managing directors of Laporte Acids, Limited, have been appointed directors. Both companies are members of the Laporte Industries, Limited, group.

NEW ELECTRONIC PRODUCTS, LIMITED—Mr. D. J. Venning has been appointed sales director of the company, a subsidiary of Honeywell Controls, Limited. He is replaced as Honeywell micro-switch division sales manager by Mr. J. L. Lunn.

NECKAR WATER SOFTENER COMPANY, LIMITED—Mr. Norman Care, general manager of Aberdare Holdings, Limited, and general manager of South Wales Switchgear, Limited, has been appointed a director of the company, a member of the Aberdare group.

HIGHFIELD GEAR & ENGINEERING COMPANY, LIMITED—Mr. John Thomas Schofield, managing director, has been appointed chairman in succession to the late Mr. G. W. Smith. He joined the company in 1936 and was appointed a director two years later. He will retain the post of managing director.

MANCHESTER DRY DOCKS COMPANY, LIMITED—Mr. C. M. B. Boulter has been appointed managing director. He has been with the company since 1943, first as secretary, then as director and secretary. Mr. Boulter has relinquished his position as secretary and Mr. H. Wilcock has been appointed to that position.

STANLEY WORKS (GB), LIMITED—Mr. Arthur G. Jones, general works manager has been appointed works director and Mr. William R. Mills, general sales manager, has been appointed sales director. Mr. Warwick M. Dingley has relinquished his seat on the board in view of his increasing commitments as director of marketing in Europe for the whole of the Stanley international organization.

Rise in Export Orders for Machine Tools

ORDER-BOOK of the machine tool industry continues to grow, and at the end of August was estimated to be worth nearly £118,800,000—an increase of £3,300,000 over the July figure. This upward trend is being sustained largely by increasing orders from abroad. The Machine Tool Trades Association said last week that orders from the home market in August were 14 per cent. less, while export orders were 34 per cent. up on a year ago. Over the eight months of this year they have risen by 15 per cent.

The slackening in home demand meant that the total value of net new orders in August was 2 per cent. less than a year earlier. While export deliveries were maintained during the month, those to the home market fell sharply to 2 per cent. less than in 1960. Taking July and August together, however, home deliveries were 9 per cent. more than in 1960. Total new orders during August were worth nearly £10,600,000 and were well in excess of deliveries, which were valued at £7,300,000.

Recent Wills

GRAELY, J. W., education and training officer of the Central Electricity Generating Board and former director of the Nuneaton Staff College of the Ministry of Power £22,222

WHITTINGTON, H. G., assistant secretary to the Clay Cross Company, Limited, lime quarries and lead mine owners, of Chesterfield (Derbyshire), until his retirement last year £4,547

FRYER, E. G., an employee of Associated Electrical Industries, Limited, since 1923 and manager of the lamp and wire factories at Preston, Trent Vale, and Rugby since 1956 ... ... £3,886

ALEXANDER, G. H., chairman and managing director and founder in 1896 of Geo. H. Alexander Machinery, Limited, machine tool manufacturers and agents, of Birmingham £359,350

HILL-COLE, FRANCIS, chairman of Wombwell Foundry Foundry & Engineering Company, Limited, a director of Barnsley District Coking Company, Limited, and other companies £30,902

ASHLEY COOPER, SIR PATRICK, former director of the General Electric Company, Limited, and Aron Electricity Meter, Limited, and at one time a director of some 60 companies £76,754

TENNENT, JAMES, noted industrialist and chairman and managing director of R. B. Tennent, Limited, makers of cast steel, steel base, and alloy steel rolls, etc., of Coatbridge (Lanarkshire) £105,219

DENHAM, FRANK, a director of Prince-Smith & Stells, Limited, machinery manufacturers, of Keighley (Yorks), and managing director of its subsidiary, Taylor Wordsworth & Company, Limited, Leeds £17,920

ANDREW, PROF. J. H., Professor of Metallurgy and Dean of the Faculty of Metallurgy in the University of Sheffield, 1932-1950, and latterly Professor Emeritus, and one of the leading British authorities on metallurgy £77,018

MORCOM, LT.-COL. R. K., former chairman of Belliss & Morcom, Limited, makers of steam turbines, engines, etc., of Birmingham, a former vice-president of the Federation of British Industries, and a director of the Iron Trades Employers' Insurance Association £107,205

BUSHINSON, GEORGE, former manager of the Digby Colliery Company, Limited, Nottingham, retiring on the company's amalgamation with the Bestwood Coal & Iron Company, Limited £15,983

ARCHDALE, FRED, a director of James Archdale & Company, Limited, machine-tool manufacturers, of Birmingham, and formerly a director of the Staveley Coal & Iron Company, Limited ... £249,738

INTESTATE

ASSINDER, A. C. F., formerly managing director of New Monckton Collieries, Limited, and the Monckton Coke & Chemical Company, Limited ... £13,065

HOLMES NORMAN, of Chesterfield (Derbyshire), and an accountant at the Bolsover office of No. 1 (Chesterfield) Area, East Midlands Divisional Coal Board £5,990

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NEWS IN BRIEF

CHAMBERLAIN PLANT, LIMITED, manufacturers of the Staffa Super-4 mobile crane and plant hire company, has now moved into its handsome new office building at Enfield (Middx).

THE SECOND information centre and showrooms set up by the North-Eastern Divisional Coal Board is in Huddersfield. The first is in Sheffield and others are to be opened in Doncaster and Wakefield.

NEW ADDRESS of Hagan Controls, Limited, which specializes in control engineering and is one of the Plessey Company, Limited, group, is Weedon Road, Northampton (telephone Northampton 260).

COUNCIL OF KING'S COLLEGE, Newcastle-upon-Tyne, has accepted an offer by Merz & McLellan, consulting engineers, of London, S.W.1, to establish a post-graduate studentship in electrical engineering.

BERGEN TEMPERED, LIMITED, a member company of the Tempered Group, Limited, has moved to new premises in Sussex Road, Sheffield, where increased floor space and production facilities are available.

FINANCE CORPORATION of the French steel industry, Groupement de l'Industrie Sidérurgique (GIS), said that its loan of NF 450,000,000 launched on October 2 was closed on Wednesday of last week with the amount fully subscribed.

MAJOR PRODUCER in Canada of a wide range of alloy and tool steels and stainless steel, Atlas Steels, Limited, Welland, Ontario, is to erect a mill to produce stainless strip at Tracy, Quebec, costing about $40,000,000.

A DIE-CASTING plant, costing about £1,250,000, is to be built by the Rootes, Limited, group, at Linwood, near Glasgow. It will be adjacent to the £22,000,000 factory now being built there for the production of a new Hillman car.

COMPENSATION PAID by the National Coal Board for damage from subsidence has exceeded £3,000,000 every year since the 1957 Subsidence Act. The total for 1957 was £3,660,000, for 1958 £3,360,000, for 1959 £3,720,000, and for 1960 £3,220,000.

NOW ON A four-day week because of a serious fall in the orders for strip steel, workers at the Rotherham steel firm of J. J. Habershon & Sons, Limited, have been told that the management hopes by the end of this month the position will have improved.

FRENCH miners who had spent nearly three weeks underground at Nancy as a protest against their dismissal because the coal mine was to close, came to the surface on Sunday. Under an agreement to end the strike, the mine will not be closed immediately.

GERMAN IRON and steel industry has contracted to take almost the same quantity of iron ore in 1962 from Sweden as it bought this year, but prices are on average 5 per cent. cheaper. The German industry takes about two fifths of Swedish iron-ore exports.

COAL EXPORTS from Australia in 1960-61 amounted to 1,902,000 tons (valued at £A7,757,000), compared with 1,117,000 tons in the previous year. Japan was the principal buyer, taking just over 1,700,000 tons in 1960-61.

THE SHORTER WORKING WEEK, its effects on productivity, the rôle of the employee, the implications for management and the problems that arise, will be discussed at a one-day conference of the British Institute of Management at the Connaught Rooms, London, W.C.2, on November 28.

AMONG THE vintage cars which completed the London to Brighton course in last Sunday's race was an 1897 Daimler entered by Mr. D. G. Flather, managing director of W. T. Flather, Limited, manufacturers of alloy and bright drawn steel bars and case hardening compounds, of Sheffield.

CONSTRUCTION IS to start early next year at the Cleveland, Ohio, works of the Jones & Laughlin Steel Corporation on what is claimed will be "the fastest hot strip mill in the world." The $60,000,000 project involves a new 80 in. hot strip mill.

CRUDE STEEL production by August-Thyssen-hütte, the West German concern, in the year ended September 30, 1961, increased to 3,926,000 (3,850,000) tons, and rolled steel production to 3,158,000 (3,120,000) tons. Group turnover increased to DM2,485,000,000 compared with DM2,415,000,000 in the previous year.

MANUFACTURERS OF tobacco processing machinery, etc., D. K. Hamblin & Company, Limited, of Radcliffe-on-Trent (Notts), has been taken over by the American Machine & Foundry Company, of New York. It will continue to operate under the same name as a subsidiary of A.M.F., Limited, London, E.C.2.

SPEAKING AT the firm's "Twenty-five Year Club" dinner last Saturday, at which nine new members were invested, bringing the total to 65, Mr. L. Farris, managing director of Tinsley Wire Industries, Limited, Sheffield, told guests that plans are to be discussed for a complete new factory and block of offices on the sports field.

LARGE-SCALE PLANT for the production of hydrogen peroxide by the Laport autoxidation process is to be built by the Elektrochemische Werke Munchen, AG, which earlier this year became a member of the Laporte Industries, Limited, group. The new German plant will be at the E.W.M. works at Hollriegelskreuth, near Munich.

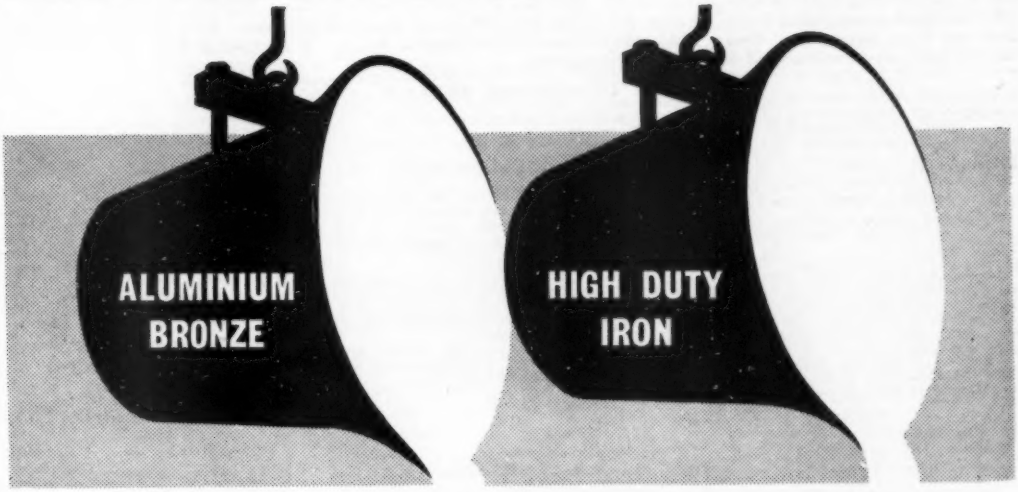
MANUFACTURING electrical engineers, Bruce Peebles & Company, Limited, Edinburgh, expects to begin light transformer production in a new factory at Broxburn (West Lothian) next week. This will enable the full heavy engineering resources at the company's Edinburgh East Pilton factory to be deployed for the manufacture of the very large and high voltage transformers.

WIRE ROPE manufacturers, Martin, Black & Company (Wire Ropes), Limited, of Coatbridge, near Glasgow, has recently combined its North-West area office and depot at enlarged premises at the depot address, 99A, Webster Road, Liverpool, 7. The depot telephone number remains Sefton Park 6669, but the office number is now Sefton Park 7556. The area sales manager is Mr. B. Sheppley.

ATTENDED BY senior executives from every branch of industry, a one-day study session on the "Recruitment, Selection and Training of Salesmen," organized by the London School of Marketing, was held on Monday. Accurate forecasting of many forms of business activity will be discussed at a top level study group organized by LSM next Thursday at the Connaught Rooms, London, W.C.2.

NEW OFFICE accommodation to house the whole of the London staff of the Ruston & Hornsby, Limited, group, has been acquired in Berkeley Square House, London, W.1. The office will be controlled by Mr. T. L. Kendall, who has been appointed executive director. Mr. J. G. Barber, London office manager for 12 years, has been appointed export area manager, Eastern block countries and is succeeded by Mr. L. J. Lawrence.

FOR THE MINING INDUSTRY...



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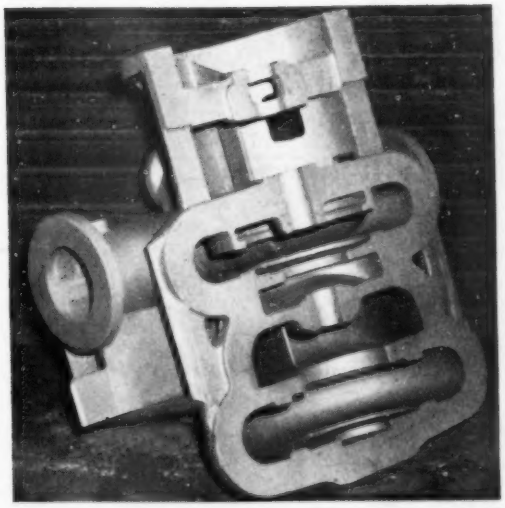

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Salary up to £1,720 p.a. with a starting figure commensurate with experience. The post carries a car allowance. Contributory pension scheme, excellent working conditions, generous holidays, sick pay scheme.

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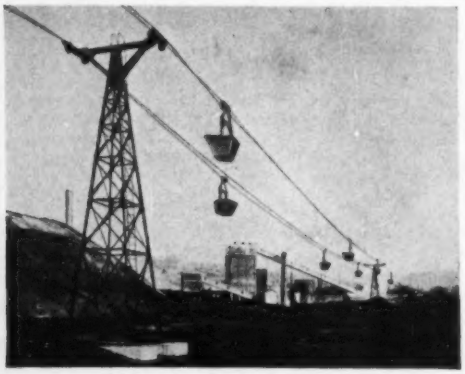

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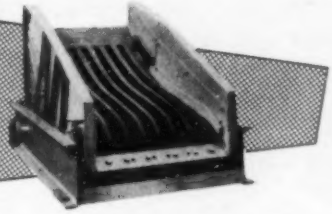

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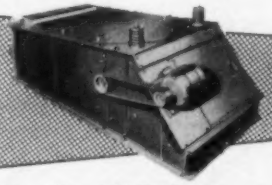

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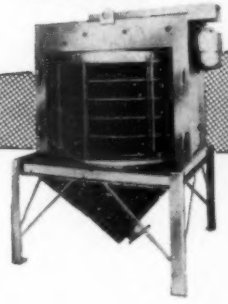

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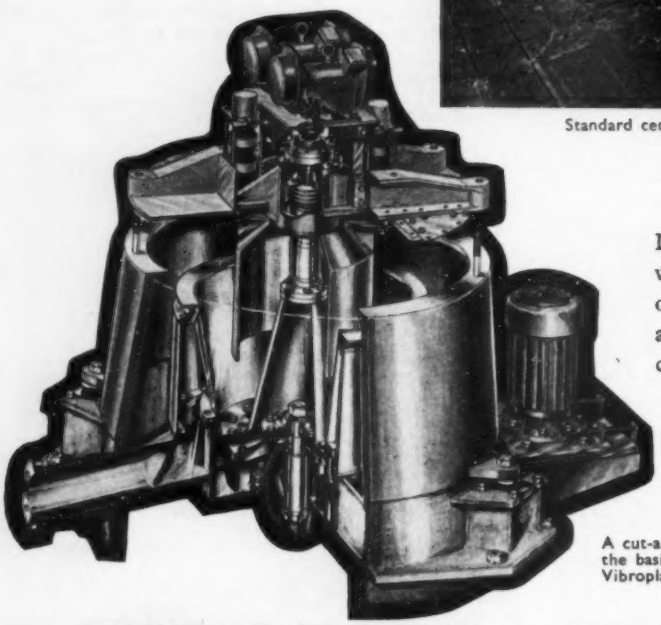

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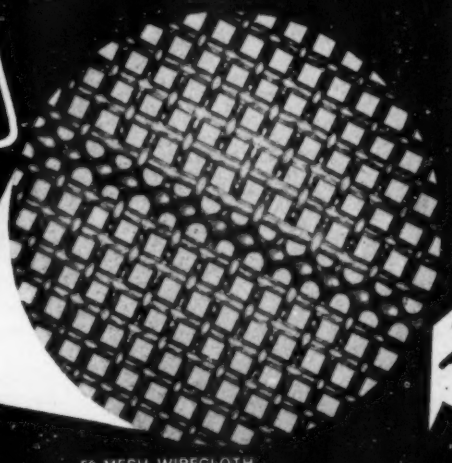

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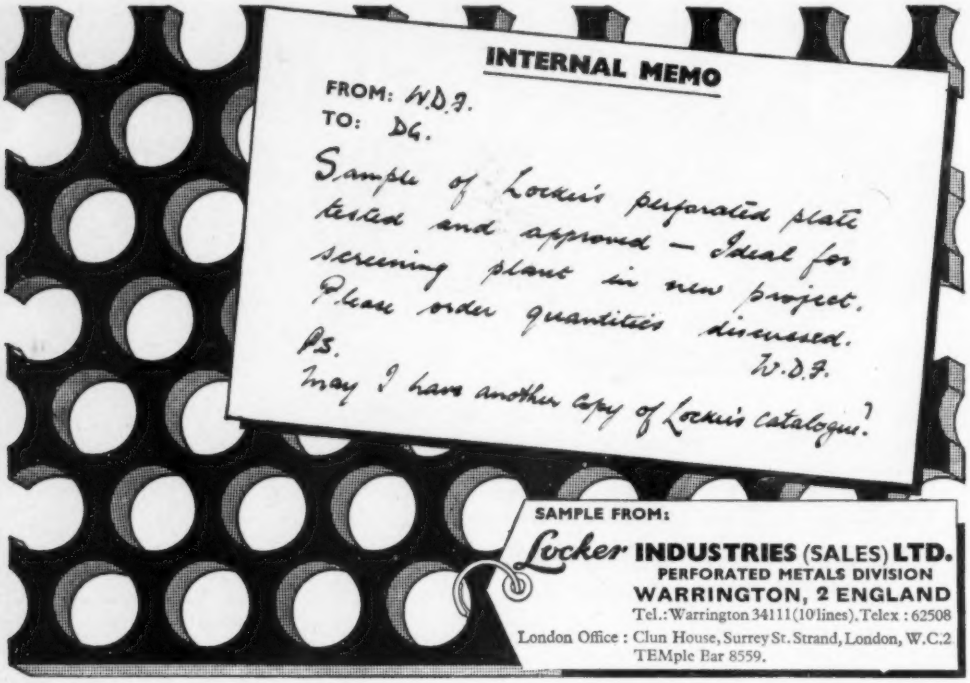
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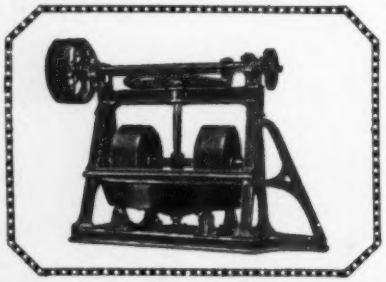

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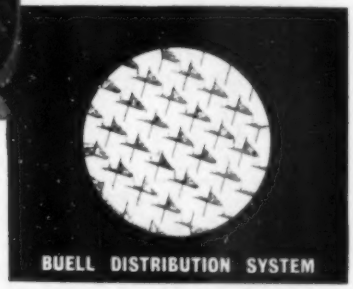

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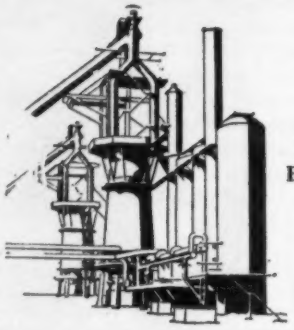

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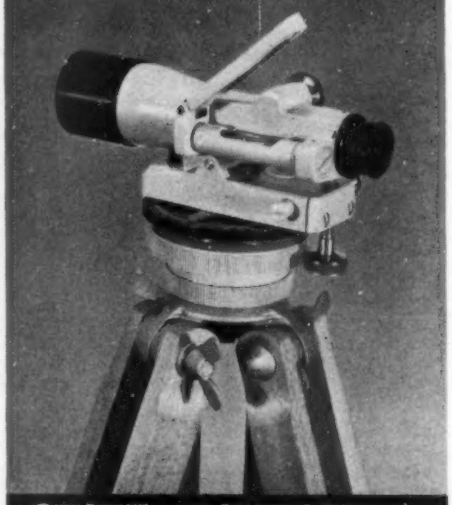

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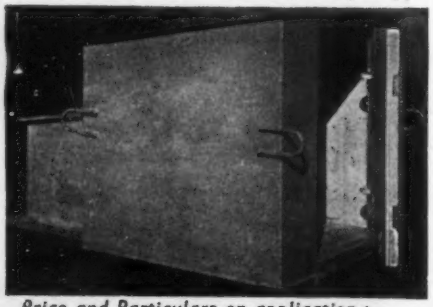

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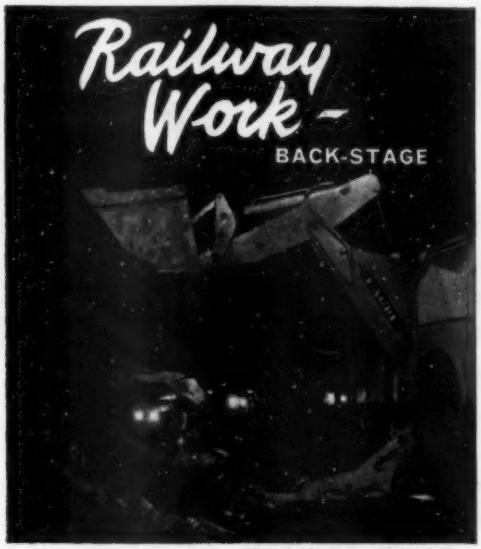

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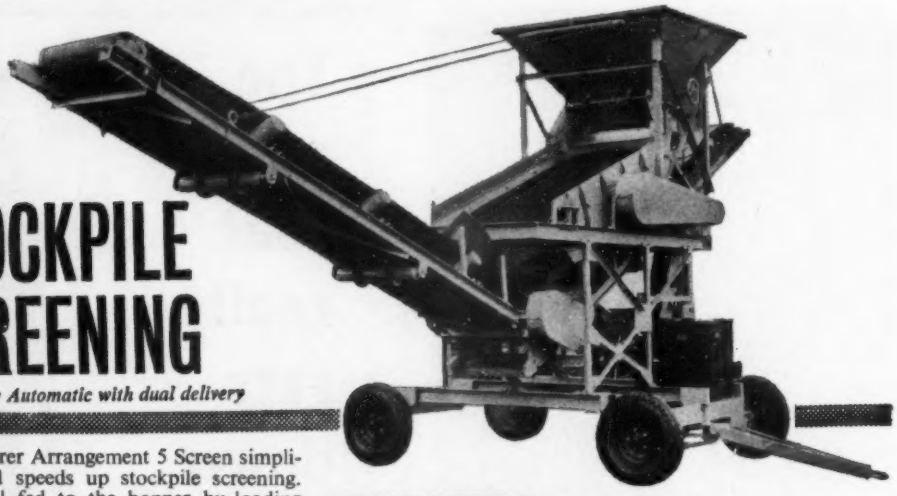

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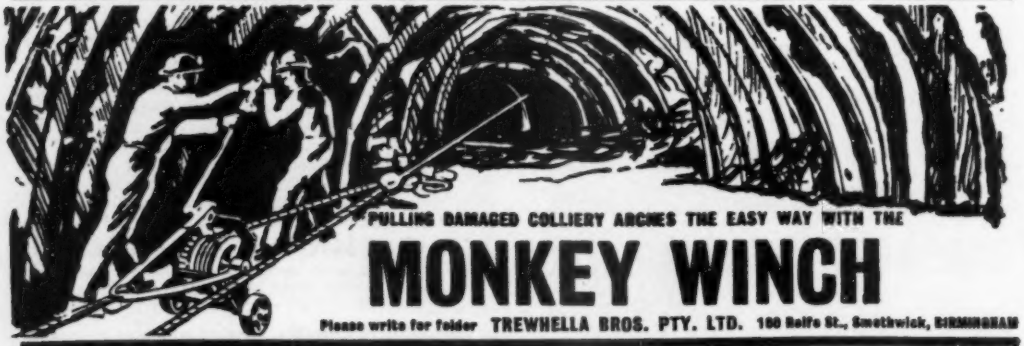

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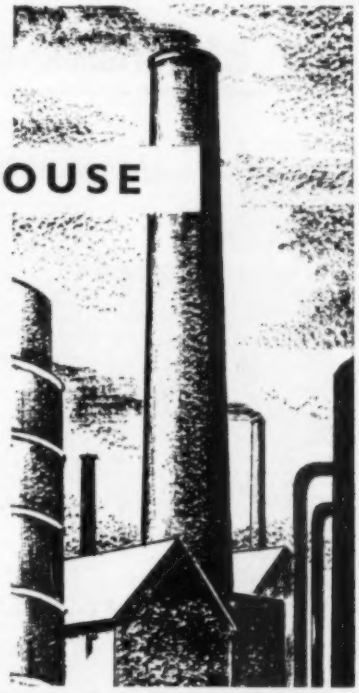

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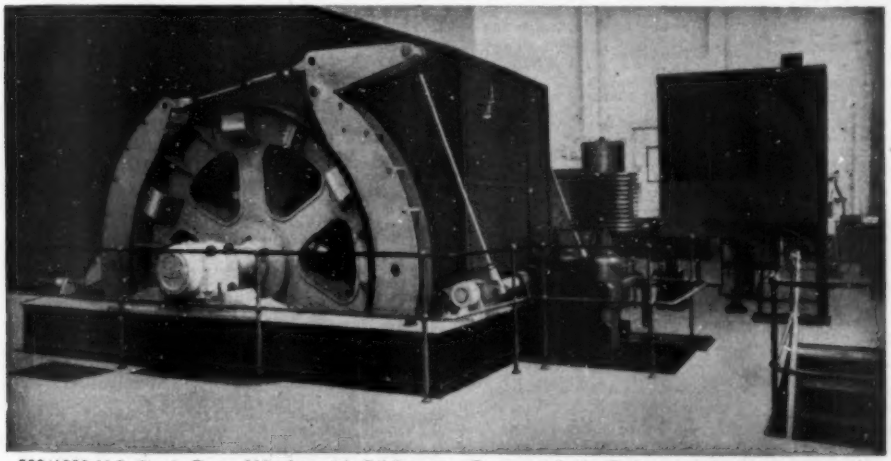

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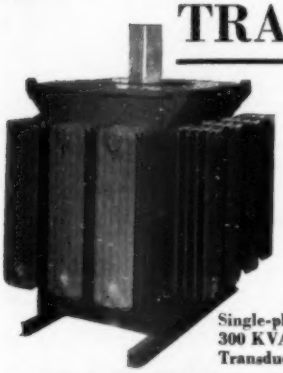

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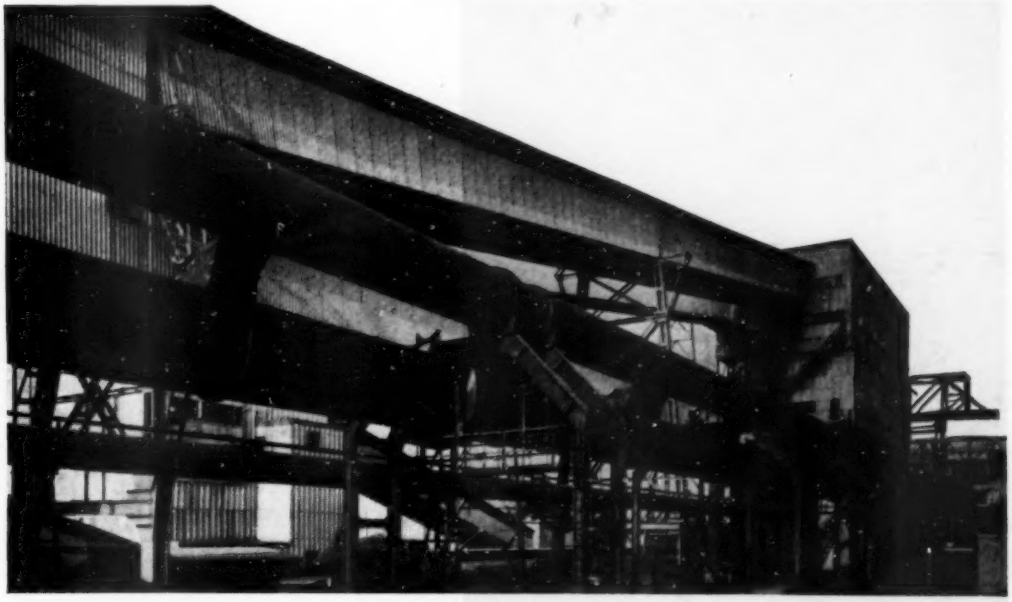

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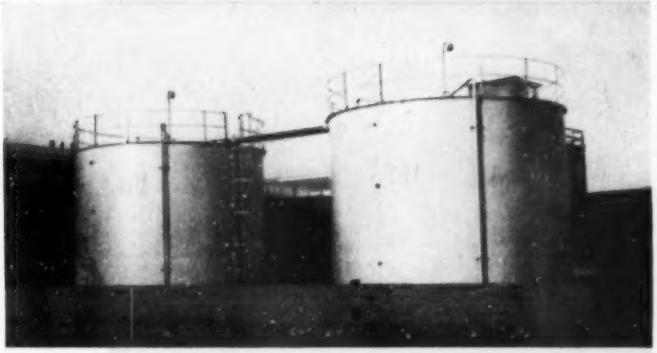

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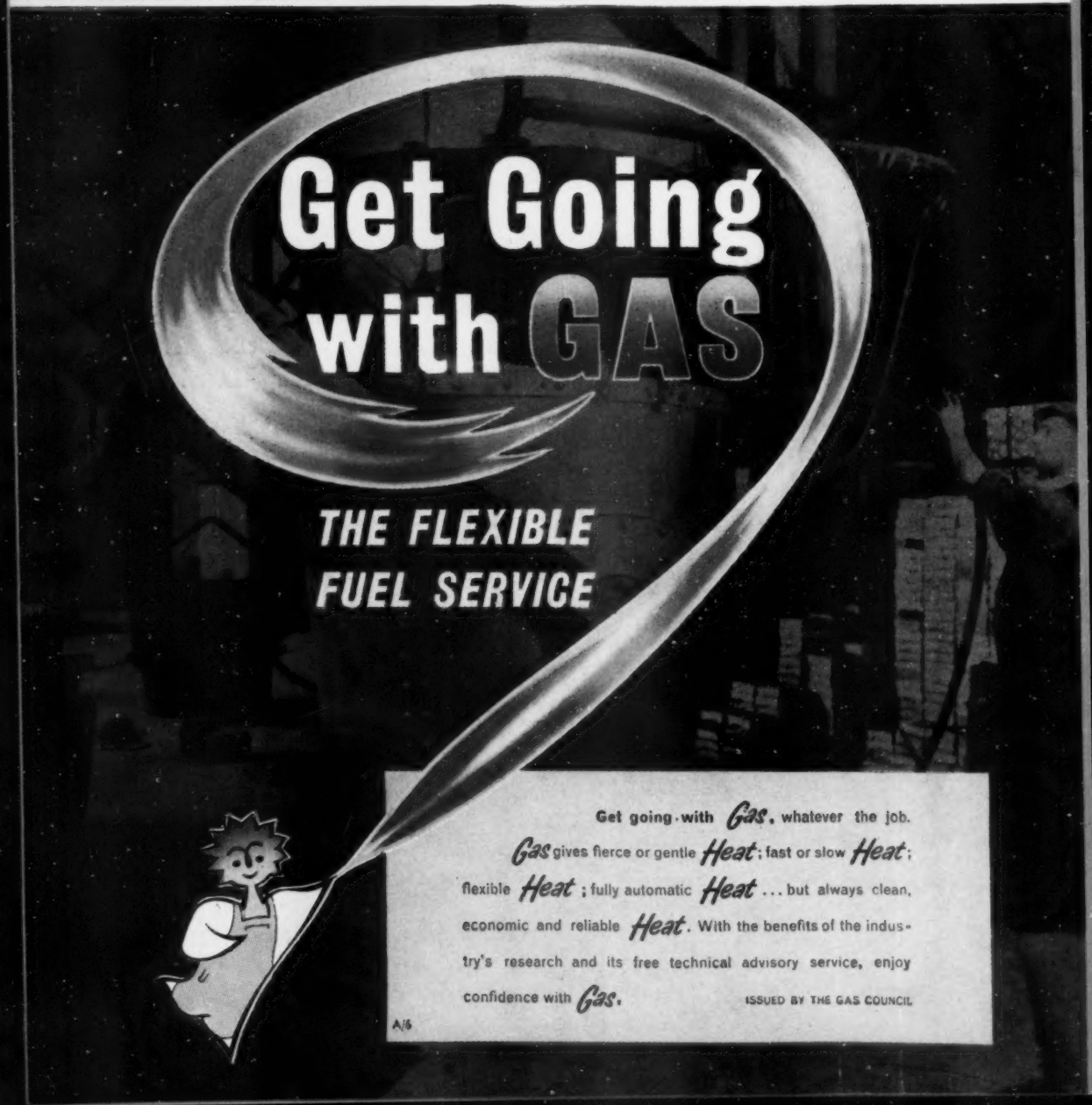
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